1983 SCIENCE AND TECHNOLOGY POSTURE HEARING WITH DIRECTOR OFFICE OF SCIENCE AND TECHNOLOGY POLICY

HEARING

BEFORE THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

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1983 SCIENCE AND TECHNOLOGY POSTURE HEARING WITH THE DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

THURSDAY, FEBRUARY 3, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, D.C.

The committee met, pursuant to call, at 9:35 a.m., in room 2318, Rayburn House Office Building, Hon. Don Fuqua, chairman, presiding.

Mr. FUQUA. The committee will be in order.

We are very pleased today to have Dr. George A. Keyworth, Director of the Office of Science and Technology Policy in the Executive Office of the President who will be our leadoff witness in a series of posture hearings that we will be holding in connection with the responsibilities of the Science Committee as it relates to our role in providing research and development funds for the Government.

We face again many critical issues and tight budget constraints, but I am pleased, Dr. Keyworth, at some of the initiatives that have been forthcoming, particularly in the field of science education and in the field of basic research that I think strengthen and support the philosophy that this committee has enunciated over the years.

I am sure there will be other areas that we may have different priorities, but I do appreciate the cordial working relationship we have had with you and your office. I ask unanimous consent that the full text of my prepared remarks and the statement by our distinguished colleague, Mr. Lujan, be included in the record.

We are pleased to welcome you this morning and pleased to receive your testimony.

[The opening statements of Messrs. Fuqua and Lujan follow:]

OPENING STATEMENT

THE HONORABLE DON FUQUA, CHAIRMAN

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
FEBRUARY 3, 1983

I AM GLAD TO WELCOME TO THE COMMITTEE TODAY DR. GEORGE A. KEYWORTH, THE DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY IN THE WHITE HOUSE. DR. KEYWORTH ALSO SERVES AS THE SCIENCE AND TECHNOLOGY ADVISOR TO THE PRESIDENT.

THIS IS OUR COMMITTEE'S FIRST HEARING OF THE 98TH CONGRESS, AND IT IS ESPECIALLY APPROPRIATE THAT DR. KEYWORTH IS OUR LEADOFF WITNESS. HE OCCUPIES, NEXT TO THE PRESIDENT HIMSELF, THE KEY POSITION IN THE GOVERNMENT WITH RESPONSIBILITY FOR THE CONTINUED HEALTH AND VITALITY OF AMERICAN SCIENCE AND TECHNOLOGY.

THE PRESENT BUDGET PROPOSALS FOR SCIENCE AND TECHNOLOGY RAISE FUNDAMENTAL QUESTIONS ABOUT THE DIRECTION OF GOVERNMENT POLICY FOR SCIENCE AND TECHNOLOGY. IT APPEARS THAT, FOR NON-DEFENSE R & D, THE CAREFULLY EVOLVED BALANCE BETWEEN SUPPORT FOR RESEARCH AND SUPPORT FOR DEVELOPMENT HAS BEEN CAST ASIDE IN FAVOR OF A POLICY OF STRONG SUPPORT FOR BASIC RESEARCH, WITH FURTHER CUT-BACKS IN THE SUPPORT FOR APPLIED RE-

SEARCH AND DEVELOPMENT.

WHILE BASIC RESEARCH PROGRAMS AT THE NATIONAL SCIENCE FOUNDATION AND THE ENERGY DEPARTMENT WOULD RECEIVE INCREASES OF, RESPECTIVELY, $180 MILLION AND $160 MILLION, IMPORTANT APPLIED RESEARCH PROGRAMS IN SUCH AGENCIES AS THE ENERGY DEPARTMENT, THE ENVIRONMENTAL PROTECTION AGENCY, AND THE NATIONAL BUREAU OF STANDARDS WOULD EITHER BE ELIMINATED ALTOGETHER OR BE SEVERELY CUT BACK. THIS NEW APPROACH COULD PRODUCE A DANGEROUS IMBALANCE AT A TIME WHEN THE TREND IN MOST OF THE OTHER ADVANCED, INDUSTRIAL COUNTRIES IS TOWARD A MUCH MORE EVEN BALANCE BETWEEN GOVERNMENT SUPPORT FOR DEVELOPMENT AND SUPPORT FOR RESEARCH.

OUR POLICY OF SUPPORT FOR BASIC RESEARCH IS WELL ESTABLISHED. BEGINNING WITH THE POST-WORLD WAR II PERIOD, THE FEDERAL GOVERNMENT ASSUMED THE MAJOR RESPONSIBILITY FOR THE FINANCING OF SCIENTIFIC RESEARCH IN AMERICA. THAT RESPONSIBILITY WAS ASSUMED IN RECOGNITION OF THE FACT THAT SCIENCE HAD BECOME A SIGNIFICANT FACTOR IN MAINTAINING A STRONG DEFENSE AND A STRONG ECONOMY, AND ALSO IN RECOGNITION OF THE FACT THAT, AT THE FUNDING LEVEL REQUIRED, NO SOURCE OTHER THAN THE GOVERNMENT COULD ASSUME THAT RESPONSIBILITY.

BUT WE ARE ALSO MINDFUL THAT OUR COMMITTEE HAS REPEATEDLY BEEN URGED TO INTRODUCE A STRONG ELEMENT OF STABILITY IN THIS AREA OF SUPPORT AND THAT DR. KEYWORTH HIMSELF JUST LAST YEAR CAUTIONED US ABOUT THE DANGERS TO QUALITY WHICH HE PERCEIVED DURING THE YEARS OF RAPID FUNDING GROWTH IN THE SEVENTIES. CAN THE FUNDING AGENCIES AND THE RESEARCH INSTITUTIONS ADEQUATELY MANAGE THESE LARGE INCREASES, AND CAN THE NEW

LEVELS OF SUPPORT BE SUSTAINED IN FUTURE YEARS?

THE GOVERNMENT'S RESPONSIBILITY FOR TECHNOLOGY HAS BEEN MORE SELECTIVE. IN THE POST-WAR YEARS AMERICAN INDUSTRY HAS MADE MANY IMPORTANT TECHNOLOGICAL ADVANCES, AND THEY WILL NO DOUBT CONTINUE TO DO SO. BUT IN THAT SAME PERIOD A NUMBER OF EXTERNAL FORCES HAVE MADE IT NECESSARY THAT THE FEDERAL GOVERNMENT PLAY A STRONGER ROLE IN SOME AREAS. FIRST SPUTNIK, AND THEN THE ENERGY CRISIS OF THE EARLY 1970'S LED US INTO APPLIED RESEARCH AND DEVELOPMENT FOR THE ADVANCEMENT OF SPACE TECHNOLOGY AND ENERGY TECHNOLOGY.

SUCCESSIVE PRESIDENTS, WORKING WITH THE CONGRESS, RECOGNIZED THAT WHERE CAPITAL REQUIREMENTS WERE LARGE, OR WHERE MARKET AGGREGATION WAS INSUFFICIENT, OR WHERE OTHER FACTORS MEANT THAT NEEDED TECHNOLOGIES WOULD NOT BE DEVELOPED, PRIVATE INDUSTRY MUST BE SUPPLEMENTED WITH GOVERNMENT EFFORTS.

TODAY WE ARE FACED WITH A NEW EXTERNAL CHALLENGE IN THE FIELD OF TECHNOLOGY. WESTERN EUROPE AND JAPAN ARE CHALLENGING THE UNITED STATES IN A GROWING NUMBER OF HIGH TECHNOLOGY FIELDS. THEY ARE ABLE TO DO THIS THROUGH A COMBINATION OF FACTORS WHICH INCLUDE A STRONG SCIENCE EDUCATION SYSTEM, LESS STRINGENT ANTI-TRUST LAWS, AND STRONG GOVERNMENT SUPPORT FOR BOTH BASIC SCIENCE AND FOR APPLIED RESEARCH AND DEVELOPMENT WORK AS WELL.

THE CRITERIA OF NATIONAL IMPORTANCE AND LACK OF SUFFICIENT PRIVATE SECTOR FUNDS WHICH HAVE LED US TO SUPPORT BASIC RESEARCH WOULD APPEAR

TO BE LESS RELEVANT IN SELECTING THOSE AREAS OF APPLIED RESEARCH AND DEVELOPMENT WHICH MUST RECEIVE GOVERNMENT ENCOURAGEMENT AND SUPPORT. FOR EXAMPLE, MANY MEMBERS OF THIS COMMITTEE HAVE PERSONALLY VIEWED THE DRAMATIC ADVANCES MADE BY JAPAN IN ROBOTICS. THESE ADVANCES ARE THE RESULT OF A STRONG GOVERNMENT-INDUSTRY-UNIVERSITY PROGRAM OF COOPERATION BEGUN YEARS AGO. A SIMILAR COOPERATIVE EFFORT MUST BE MADE HERE.

IN THE AREA OF SCIENCE EDUCATION, THE BUDGET CONTAINS SEVERAL WELCOME INITIATIVES. I APPLAUD THE ADMINISTRATION FOR ITS RECOGNITION OF THE IMPORTANCE OF SCIENCE EDUCATION TO OUR FUTURE. BUT IT IS NOT AT ALL CLEAR THAT THESE INITIATIVES ARE SUFFICIENT TO COPE WITH THE MAGNITUDE OF THE PROBLEMS WE FACE.

I RECENTLY DISCUSSED THIS MATTER WITH A GROUP OF JAPANESE STUDENTS WHO HAD STUDIED BOTH IN THE UNITED STATES AND IN JAPAN. THEIR OBSERVATION WAS THAT WHILE GRADUATE EDUCATION IN THE U.S. STILL IS CLEARLY THE BEST IN THE WORLD, AT THE UNDERGRADUATE LEVEL, AND ESPECIALLY AT THE HIGH SCHOOL LEVEL, SCIENCE AND MATHEMATICS EDUCATION IS CLEARLY INFERIOR. WHAT MUST BE DONE IN A COMPREHENSIVE WAY TO DEAL WITH THIS SITUATION, AND WILL THE ADMINISTRATION'S NEW PROPOSALS FIT INTO THIS LARGER SET OF SOLUTIONS?

THESE ARE SOME OF THE ISSUES RAISED BY THE PROPOSALS CONTAINED IN THE FISCAL YEAR 1984 BUDGET. DR. KEYWORTH HAS BEEN THE FOCAL POINT IN THE FORMULATION OF THE POLICIES ON WHICH THE DETAILED BUDGET PROPOSALS ARE BASED, AND WE LOOK FORWARD TO HIS TESTIMONY. HIS STATEMENT, AND OUR SUBSEQUENT DISCUSSION WILL BE VERY HELPFUL.

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OPENING STATEMENT BY

HONORABLE MANUEL LUJAN, JR.

SCIENCE & TECHNOLOGY OSTP

POSTURE HEARING

THANK YOU MR. CHAIRMAN. I WANT TO WELCOME DR. KEYWORTH, A FORMER CONSTITUENT WHO HAS DONE AN EXCELLENT JOB IN FOCUSING POLICY ON SCIENCE AND TECHNOLOGY IN THIS ADMINISTRATION.

I KNOW THAT DR. KEYWORTH SHARES MANY CONCERNS WITH MYSELF AND OTHER MEMBERS OF THE COMMITTEE. A HIGH PRIORITY ON THIS LIST OF CONCERNS IS THE ENCOURAGEMENT OF TECHNICAL EDUCATION IN THE U.S. IN THE POST-SPUTNIK ERA, THE U.S. PLACED GREAT EMPHASIS ON DEVELOPING A STRONG BASE OF TECHNICAL MANPOWER. SOME EXAMPLES OF THE RESULTS OF THAT PUSH IS THE DRAMATIC ADVANCES THE U.S. HAS MADE IN ELECTRONICS, COMPUTERS, MEDICINE, AND THE SPACE PROGRAM OVER THE PAST 30 YEARS. IN FACT, NO PROGRAM HAS MADE THE PUBLIC MORE AWARE OF THE EXCITEMENT, THE GLAMOUR, OF SCIENCE AND TECHNOLOGY THAN THE SPACE PROGRAM. THE RECENT SUCCESS OF VIDEO GAMES SEEMS TO BE RENEWING THE INTEREST OF OUR YOUNG PEOPLE IN TECHNICAL AREAS. THESE ARE CERTAINLY REASSURING SUCCESSES. BUT SUCCESS HAS MEANT COMPLACENCY. THERE IS NO LONGER THE STRONG EMPHASIS ON SCIENCE, MATH, AND ENGINEERING IN OUR SCHOOLS. DURING THE LAST CONGRESS, THERE WAS MUCH DISCUSSION OF OUR NATIONAL FAILURE TO GRADUATE SUFFICIENT TECHNICALLY TRAINED YOUNG PEOPLE TO MEET FUTURE NEEDS. WE ALL KNOW THAT IT IS IMPERATIVE THAT THE U.S. MAINTAIN

IT'S ROLE OF INTERNATIONAL LEADERSHIP IN TECHNOLOGY DEVELOPMENT. WE ALL REALIZE THAT TECHNICAL EDUCATION IS THE BASE FOR FUTURE TECHNOLOGICAL LEADERSHIP.

I LOOK FORWARD TO FUTURE DISCUSSIONS OF THE WAYS TO ENCOURAGE MORE PEOPLE TO GET A STRONG EDUCATION IN SCIENCE, MATH, AND ENGINEERING.

THANK YOU MR. CHAIRMAN.

Mr. SENSENBRENNER. Mr. Chairman, on behalf of the minority, I have a statement.

I thank you for the opportunity to welcome Dr. Keyworth, Director of the Office of Science and Technology Policy.

I have reviewed the administration's proposed fiscal year 1984 science budget. I know Dr. Keyworth brings us good news.

I was at the last hearing of this committee that Dr. Keyworth spoke at. I know my friends on the other side of the aisle had lots of barbs to throw in your path, doctor. I am waiting for the majority staff to bring in some bags of rose petals to strew in your path today because of the changes in the budget.

We are all aware of the prime importance of basic fundamental research. This committee has always stressed the need for a strong science program as the foundation of long-term industrial growth and national security.

Our Nation faces a serious threat to our technological leadership in the world. It is only through continual emphasis on basic research that we will maintain and strengthen our position.

This emphasis will continue to assure that America remains strong in the competitive world markets while enabling us to share our technological innovations to help less fortunate nations.

I will not dwell on details, but there are several features of the proposed science budget which warrant emphasis.

In energy-related fields, the requested general science program is $645 million. That is an increase of 18 percent over the amount appropriated for fiscal year 1983.

The administration has requested a similar increase in funding for basic energy sciences to $350 million. These increases take on added significance when we remember that our inflation rate has dropped from double-digits to about 5 percent annually. So the requested funding increase is not for the purpose of maintaining a steady rate. Instead, it indicates a commitment to increase the pace.

Another facet of this budget which strikes home is the attention being given to the shortage of faculty in critical university fields.

The program is sufficiently comprehensive to include upgrading of the science and mathematical qualifications of secondary school teachers. The budget also proposes to replace and upgrade obsolete

research instrumentation at universities. That is a training and research deficiency cited by many of our expert witnesses before this committee in the past year.

Mr. Chairman, the administration's research philosophy appears to be very much in harmony with our own. I look forward to Dr. Keyworth's testimony.

Mr. FUQUA. Thank you, Mr. Sensenbrenner.

Dr. Keyworth, again we are pleased to have you with us. We appreciate the effort you made to be here today. I know that most people would probably want to be in bed, but we appreciate the extra effort required for you to be here today. We hope it will not be a prolonged hearing and that you can get back to bed as you have been ordered by the doctor.

Please proceed.

STATEMENT OF DR. GEORGE A. KEYWORTH, SCIENCE ADVISER TO THE PRESIDENT AND DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. KEYWORTH. Thank you very much, Chairman Fuqua, and Mr. Sensenbrenner, for your comments.

Members of the committee, I am very pleased to have this opportunity to meet with you so soon in the legislative year.

Not only does this give us an early chance to discuss the President's proposed fiscal year 1984 R&D programs; it also gets a timely start on the important process of congressional oversight and review of this vital area of Federal activity.

Mr. Chairman, in order to allow enough time for discussion with the committee, with your permission I would like to submit my formal statement for the record and present a summary of it at this time.

Mr. FUQUA. Without objection, we will make the statement in its entirety part of the record. You may proceed to summarize.

Dr. KEYWORTH. Thank you.

In my early meetings with this committee, I emphasized that the administration would look very hard at how science and technology could help advance national well-being. We all agree on the need to maintain and strengthen the health of our science and technology enterprise as a national resource. But we also have a responsibility to make sure the Nation gets the best possible return on its Federal investments in science and technology.

Let me describe three criteria embodied in our proposed programs for fiscal year 1984 that guide us toward that end.

First, any evaluation of the state of American science and technology today clearly reveals fields of research ripe for profound intellectual advances.

Much of my office's efforts focus on identifying those opportunities, and you will see that they constitute the areas of greatest emphasis in the R&D budget.

Second, society derives two tangible benefits from R&D. One is the transfer of knowledge from the lab to society in the form of technological innovations that result in new industries, new jobs, and improvements in our standards of living and quality of life.

We are determined to stimulate greater interaction of academic, Federal, and industrial scientists and engineers, and to make sure the best R&D is supported well enough to permit rapid progress.

We also have to make sure that we derive educational and training advantages from federally supported research because all of our expectations and opportunities for industrial progress call for a growing supply of skilled technical personnel.

The most direct way to meet those needs is through university research in which graduate students and others participate. Federal programs must make sure the academic research community is fairly treated in competition with other research performers.

The third criterion is the appropriateness of the role of the Federal Government in R&D. We have continued to shift the Federal role away from demonstrations of technology and back toward its appropriate role of basic research and non-commercial development.

I said at the outset that R&D are tools to help the Nation. Let me review briefly the major national goals that are particularly affected by our R&D policy.

Certainly defense is a major element of the overall R&D budget. I realize that this committee is not directly involved with defense R&D, but I do want to emphasize the great reliance the United States places on maintaining a technological advantage over our adversaries rather than trying to match up in terms of troop strength and deployment.

Our other major concern is how Federal investment and leadership in R&D can contribute to the Nation's economic progress. R&D is no panacea for many of the problems of competitiveness that U.S. industry must meet. But I think we all share the belief that it can help and that we can use it more effectively than we do.

For that reason you will find that a number of our proposed fiscal year 1984 initiatives facilitate the interaction between fundamental research and its eventual applications in industry, as well as encourage new kinds of interactions between universities, federal laboratories, and industry.

Mr. Chairman, the complete budget proposal, as well as the special analysis on R&D, describes how the administration is implementing its policy priorities, especially the focus on university basic research, in the next fiscal year.

We are convinced that those areas of R&D projected for growth will make important contributions to America's technological leadership in coming years. We expect to reap a harvest of innovation and trained people from this investment. Their impact will be measured in future improved competitiveness of our industries, improved balance of trade, and creation of new jobs for American workers.

I want to make clear that we are not proposing a general infusion of Federal funds into R&D, even though many areas have been consistently underfunded over the past decade. This new growth is guided by both intellectual opportunity and long-term relevance to industrial needs.

It is decidedly not science for science's sake. Our intent is not to simply beef up a field by increasing the number of projects. The real return on this added investment will come from concentrating

on the very best projects we can identify and by providing enough funding to permit those nuclei to grow into world-leading concentrations of research excellence.

As an example, you will notice that we are proposing healthy increases in many of the National Science Foundation programs for the coming year. These reflect both the research opportunities I have already discussed and also the mission of NSF, which is to support basic research in the nation's universities, which do require special attention.

In spite of the Federal investment in basic research over the past 20 years, our academic institutions are growing shabby, at least in the areas of physical sciences and engineering, partly because an inordinate share of that support has gone to other institutions, particularly Federal laboratories.

With few exceptions, universities have become less attractive places to pursue research careers in those fields.

Inadequate equipment and instrumentation are limiting the quality of both research and education. Salaries for young faculty are so low that many new Ph. D's forego what, not many years ago, would have been their preferred career choices.

Moreover, many of the best university research projects have not been funded at high enough levels to take full advantage of their potential. Somehow we have arrived at the indefensible position of creating the poorest climate for research in the very place that ought to have the best.

That has to be changed, both to protect the world-leading basic research capability we have built up over three decades, and to make sure the universities can uphold the high standards for education that we have come to rely on from them.

This critical problem of education underlies the future of our whole civilian and defense R&D capabilities. This salient fact accounts to an important extent for our emphasis on Federal funding of research through the NSF and other university-oriented programs.

For example, in fiscal year 1984, NSF basic research grants will support approximately 10,400 graduate students, who will then be available for the large S&T industrial personnel needs projected for the end of the decade and beyond.

In the past year we have also been consulting with many professional groups and universities about other problems of science and engineering education. We have now devised several specific new programs to address what we feel is perhaps the most critical problem, the inadequate supply of new junior engineering and science faculty in universities, and the shortage of qualified secondary school science and math teachers.

One program, called the Presidential Young Investigator Awards and administered by the NSF, will attract recent PhDs to university research who might otherwise choose non-teaching careers in industry.

There are also several new programs aimed at improving the supply of qualified science and math teachers in secondary schools.

The costs for these education programs will not be great, but by concentrating resources strictly where they are most needed—on good faculty—we anticipate substantial long-term benefits.

We also see fiscal year 1984 as a time to make needed inroads on another major university research problem, outmoded and obsolete research equipment and instrumentation.

In all, we estimate the proposed level of basic research funding will include nearly $400 million for purchase and replacement of instrumentation.

Mr. Chairman, you will note that the comparisons between basic research in fiscal year 1983 and 1984 are dominated by two things: the large increases in the physical sciences and engineering, some 15 percent over 1 year, and the increase of about 3 percent for the life sciences.

The life sciences, a very productive and immensely rich area of research, have experienced a high growth rate since the mid-1960's. Given the resources already committed to the life sciences over the years, we are confident that the most promising research in those fields will continue to be well supported.

We now have to concentrate on those areas in the physical sciences and engineering that have been seriously neglected, yet which promise great return to our foremost national priorities, industrial advances to fuel our economy and defense.

I believe fiscal year 1984 can be a pivotal year for Federal programs in R&D. The administration has worked long and hard to structure a science and technology policy that addresses critical needs in our society. We are anxious to work with the Congress to set the country on a productive course to make the best possible use of the resources and potential of our universities, Federal laboratories and industrial enterprise.

Mr. Chairman, this concludes my presentation. I would be happy to respond to questions from members of the committee.

[The prepared statement of Dr. Keyworth follows:]

PROPOSED TESTIMONY OF DR. GEORGE A. KEYWORTH, II
SCIENCE ADVISOR TO THE PRESIDENT, AND
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY,
EXECUTIVE OFFICE OF THE PRESIDENT

TO THE COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

HEARINGS ON SCIENCE POLICY

FEBRUARY 3, 1983

Chairman Fuqua and Members of the Committee:

I'm pleased to have this opportunity to meet with you so soon in the legislative year. Not only does this give us an early chance to discuss the President's proposed FY 1984 R&D programs, it also gets a timely start on the important process of Congressional oversight and review of this vital area of federal activity.

We're concerned here today with the broad policy issues of science and technology. That is, what are the principles that, first, guide our decisions about how federal science and technology will be conducted, and, second, guide our specific proposals for levels of federal support?

MR. CHAIRMAN, IN MY EARLY MEETINGS WITH THIS COMMITTEE I EMPHASIZED THAT THE ADMINISTRATION WOULD LOOK VERY HARD AT HOW SCIENCE AND TECHNOLOGY COULD HELP ADVANCE NATIONAL WELL-BEING. THIS DIFFERED SOMEWHAT FROM THE TRADITIONAL APPROACH TO S&T POLICY--WHICH PLACED PRIMARY EMPHASIS ON ENSURING THE GENERAL HEALTH AND VITALITY OF SCIENCE AND ITS INSTITUTIONS.

WE ARE, OF COURSE, THE BENEFICIARIES OF THOSE MANY YEARS OF SUPPORT AND BUILDUP OF S&T INSTITUTIONS. AND I'M CONVINCED THAT AMERICAN S&T IS STILL, OVERALL, BY FAR THE WORLD'S BEST. BY ALMOST ANY MEASURE--NUMBER OF SCIENTISTS, QUALITY OF UNIVERSITY PROGRAMS, NOBEL PRIZES, AMOUNT OF MONEY INVESTED--WE SURPASS ANY OTHER NATION. WE HAVE TREMENDOUS TOOLS AND RESOURCES AVAILABLE, AND OUR TECHNICAL COMMUNITY IS CAPABLE OF MOMENTOUS ACHIEVEMENTS.

WE ALL AGREE ON THE NEED TO MAINTAIN AND STRENGTHEN THE HEALTH OF OUR S&T ENTERPRISE AS A NATIONAL RESOURCE. BUT THAT, IN ITSELF, WOULD BE INADEQUATE POLICY GUIDANCE TO MEET THE GROWING--AND MUCH DISCUSSED--TECHNOLOGICAL CHALLENGES FROM FOREIGN INDUSTRIAL AND MILITARY COMPETITORS. POLICIES THAT SERVED THE NATION WELL DURING DECADES OF RELATIVE ECONOMIC AFFLUENCE AND OVERWHELMING AMERICAN TECHNOLOGICAL SUPERIORITY OVER OTHER NATIONS MUST BE

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MODIFIED TO DEAL WITH TODAY'S HARSHER CONDITIONS. ALL OF US HAVE A RESPONSIBILITY TO MAKE SURE THE NATION GETS THE BEST POSSIBLE RETURN ON ITS FEDERAL INVESTMENTS IN SCIENCE AND TECHNOLOGY.

THREE DISTINCT CRITERIA ARE EMBODIED IN OUR PROPOSED PROGRAMS FOR FY 1984. BY APPLYING THOSE THREE CRITERIA--AND BY RESISTING THE TEMPTATION TO DIVERT SCARCE RESOURCES TO QUICK-FIXES OF SHORT TERM PROBLEMS--WE'RE CONFIDENT WE'VE ESTABLISHED PRIORITIES THAT ADDRESS U.S. NEEDS FOR MANY YEARS TO COME.

ANY EVALUATION OF THE STATE OF AMERICAN SCIENCE AND TECHNOLOGY TODAY CLEARLY REVEALS FIELDS OF RESEARCH RIPE FOR PROFOUND INTELLECTUAL ADVANCES, VIRTUALLY BURSTING WITH EXCELLENT IDEAS AND PEOPLE. MUCH OF MY OFFICE'S EFFORTS FOCUS ON IDENTIFYING THOSE OPPORTUNITIES--AND YOU'LL SEE THAT THEY CONSTITUTE THE AREAS OF GREATEST GROWTH IN THE R&D BUDGET. WE'RE CONFIDENT THAT THESE EMPHASES REFLECT BROAD AND INFORMED CONSENSUS OF THE S&T COMMUNITY. WE'VE CONSULTED WITH THE SCIENCE AGENCIES, TAPPED THE EXPERTISE OF THE WHITE HOUSE SCIENCE COUNCIL AND THE NATIONAL ACADEMY OF SCIENCES, AND SOUGHT OUT MANY, MANY INTERACTIONS WITH REPRESENTATIVES OF THE NATION'S SCIENCE AND TECHNOLOGY ORGANIZATIONS. SO THAT FIRST CRITERION--OPPORTUNITY FOR SCIENTIFIC

ADVANCE--GUIDES THE SELECTIONS OF AREAS FOR FASTEST GROWTH.

SECOND, HOW ELSE DO WE ASSURE THE BEST RETURN ON OUR INVESTMENT? HERE WE'RE TALKING ABOUT PERTINENCE, AND WE HAVE TO REMEMBER THAT BASIC RESEARCH DOESN'T EXIST IN A VACUUM. SOCIETY--THAT IS, THE PEOPLE PAYING THE BILLS FOR FEDERAL PROGRAMS--DERIVE TWO TANGIBLE BENEFITS FROM R&D. ONE IS THE EVENTUAL TRANSFER OF KNOWLEDGE FROM THE LAB TO SOCIETY--IN THE FORM OF TECHNOLOGICAL INNOVATIONS THAT RESULT IN NEW INDUSTRIES, NEW JOBS, AND IMPROVEMENTS IN OUR STANDARDS OF LIVING AND QUALITY OF LIFE. WE ALL KNOW THAT TRANSFER OF KNOWLEDGE IS A MYSTERIOUS PROCESS, DIFFICULT TO PREDICT AND RESISTANT TO MANIPULATION. WHILE WE RECOGNIZE THAT IT'S UNWISE TO TAMPER WITH MECHANISMS WE DON'T UNDERSTAND, WE CAN AT LEAST FOCUS ON IMPROVING THE CLIMATE THAT PERMITS TRANSFER OF KNOWLEDGE TO OCCUR. THAT MEANS STIMULATING GREATER INTERACTION OF ACADEMIC, FEDERAL, AND INDUSTRIAL SCIENTISTS AND ENGINEERS, AND MAKING SURE THE BEST R&D IS SUPPORTED WELL ENOUGH TO PERMIT RAPID PROGRESS.

WE ALSO HAVE TO MAKE SURE THAT WE DERIVE EDUCATIONAL AND TRAINING ADVANTAGES FROM FEDERALLY SUPPORTED RESEARCH--BECAUSE ALL OF OUR EXPECTATIONS AND OPPORTUNITIES FOR INDUSTRIAL PROGRESS CALL FOR A GROWING SUPPLY OF

SKILLED TECHNICAL PERSONNEL. THE MOST DIRECT WAY TO MEET THOSE NEEDS IS THROUGH UNIVERSITY RESEARCH, WHICH IS SYNONYMOUS WITH THE PRODUCTION OF SCIENTIFIC AND TECHNICAL PERSONNEL. THE OPPORTUNITY FOR GRADUATE STUDENTS TO BECOME MEMBERS OF THE RESEARCH COMMUNITY AS PARTNERS IN FACULTY RESEARCH PROJECTS IS OFTEN THE MOST IMPORTANT PRODUCT OF A RESEARCH GRANT. FEDERAL PROGRAMS MUST ONCE AGAIN EMPHASIZE THIS DUAL BENEFIT FROM UNIVERSITY RESEARCH AND MAKE SURE THE ACADEMIC RESEARCH COMMUNITY IS FAIRLY TREATED IN COMPETITION WITH OTHER RESEARCH PERFORMERS.

THE THIRD CRITERION IS ONE YOU'VE HEARD ME DISCUSS BEFORE--THE APPROPRIATENESS OF THE ROLE OF THE FEDERAL GOVERNMENT IN R&D. WITH EACH SUCCEEDING YEAR WE HAVE TRIED TO DISTINGUISH MORE CLEARLY BETWEEN FEDERAL AND PRIVATE SECTOR RESPONSIBILITIES. I WANT TO EMPHASIZE THAT THIS MISSION IS NOT BORN OF IDEOLOGY, BUT PRACTICALITY. THE PRIVATE SECTOR, WHICH OPERATES IN THE MARKETPLACE, IS FAR MORE SUCCESSFUL THAN THE GOVERNMENT IN UNDERTAKING COMMERCIALLY ORIENTED, SHORT-TERM TECHNOLOGY PROGRAMS. SO WE'VE CONTINUED TO SHIFT THE FEDERAL ROLE AWAY FROM DEMONSTRATIONS OF TECHNOLOGY AND BACK TOWARDS ITS APPROPRIATE ROLE OF BASIC RESEARCH AND NON-COMMERCIAL DEVELOPMENT.

I SAID AT THE OUTSET THAT R&D ARE TOOLS TO HELP THE NATION. LET ME REVIEW, BRIEFLY, THE MAJOR NATIONAL GOALS THAT ARE PARTICULARLY AFFECTED BY OUR R&D POLICY.

CERTAINLY DEFENSE IS A MAJOR ELEMENT OF THE OVERALL R&D BUDGET. I REALIZE THAT THIS COMMITTEE IS NOT DIRECTLY INVOLVED WITH DEFENSE R&D, BUT I DO WANT TO EMPHASIZE THE GREAT RELIANCE THE UNITED STATES PLACES ON MAINTAINING A TECHNOLOGICAL ADVANTAGE OVER OUR ADVERSARIES--RATHER THAN TRYING TO MATCH UP IN TERMS OF TROOP STRENGTH AND DEPLOYMENT.

UNFORTUNATELY, OVER A PERIOD OF TWENTY YEARS WE HAVE CONSISTENTLY UNDERINVESTED IN DEFENSE R&D--IN EFFECT COASTING ON THE ADVANTAGE WE HELD MANY YEARS AGO. THAT NEGLECT HAS CAUGHT UP WITH US AND TRULY THREATENS THE BASIS OF OUR SECURITY. THAT BALD REALITY IS THE REASON FOR THIS ADMINISTRATION'S EMPHASIS ON DEFENSE R&D IN PREVIOUS BUDGETS AND IN THIS ONE AS WELL. EVEN SO, WE'RE INVESTING A FAR SMALLER PORTION OF OUR RESOURCES IN DEFENSE TODAY THAN WE DID TWENTY YEARS AGO.

OUR OTHER MAJOR CONCERN IS HOW FEDERAL INVESTMENT AND LEADERSHIP IN R&D CAN CONTRIBUTE TO THE NATION'S ECONOMIC PROGRESS. THIS ISN'T A NEW ISSUE, BUT IT'S BECOME

SPOTLIGHTED IN THE PAST FEW YEARS BECAUSE OF THE RISE IN TECHNOLOGICAL AND INDUSTRIAL COMPETENCE AND ASPIRATIONS OF MANY OTHER NATIONS. WE'RE SEEING NOW, AS IF WITH NEW EYES, THAT FOR A HIGHLY TECHNOLOGICAL INDUSTRIAL SOCIETY LIKE OURS,, SLUGGISH TRANSFER OF NEW KNOWLEDGE AND EXPLOITATION OF NEW TECHNOLOGY CAN HAVE PROFOUND, TRAGIC IMPACTS ON MATURE INDUSTRIES.

R&D IS NO PANACEA FOR MANY OF THE PROBLEMS OF COMPETITIVENESS THAT U.S. INDUSTRY MUST MEET. BUT I THINK WE ALL SHARE THE BELIEF THAT IT CAN HELP AND THAT WE MUST USE IT AS EFFECTIVELY AS WE CAN. MOREOVER, R&D IS THE ESSENTIAL SOURCE OF KNOWLEDGE FOR NEW INDUSTRIES--AND, EVENTUALLY, NEW JOBS. AS A NATION WE'RE COMMITTED TO GROWTH THROUGH NEW TECHNOLOGY; THAT <u>IS</u> OUR FUTURE. SO WE'RE CONFRONTED WITH THE CHALLENGE OF USING FEDERAL R&D PROGRAMS TO ACHIEVE MAXIMUM IMPACT ON OUR DESTINY. FOR THAT REASON YOU'LL FIND THAT A NUMBER OF OUR PROPOSED FY 1984 INITIATIVES ARE DESIGNED TO FACILITATE THE INTERACTION BETWEEN FUNDAMENTAL RESEARCH AND ITS EVENTUAL APPLICATIONS IN INDUSTRY.

WE'RE ALSO ENCOURAGING, THOUGH NOT NECESSARILY AS PART OF THE BUDGET, NEW KINDS OF INTERACTIONS BETWEEN UNIVERSITIES, FEDERAL LABORATORIES, AND INDUSTRY. I'LL GIVE AN EXAMPLE A BIT LATER, BUT LET ME ADD THAT I'VE OBSERVED STRONG, NEW

INTEREST FROM MANY INDUSTRIES AND UNIVERSITIES IN GETTING TO KNOW EACH OTHER BETTER AND IN TRYING TO SEE HOW THEY CAN HELP EACH OTHER ACHIEVE THEIR GOALS. I ATTRIBUTE THIS HEALTHY DEVELOPMENT PRIMARILY TO A NEW--AND I CERTAINLY HOPE LASTING--REALIZATION OF THE NEED TO IMPROVE OUR DOMESTIC CLIMATE FOR TRANSLATING RESEARCH INTO NEW TECHNOLOGIES.

BEFORE DISCUSSING SPECIFICS OF THE FY 1984 R&D PROGRAMS, I'D LIKE TO HIGHLIGHT SEVERAL OSTP ACTIONS DURING THE PAST YEAR THAT HAVE IMPORTANT POLICY RAMIFICATIONS.

I'LL ONLY MENTION IN PASSING THE ADMINISTRATION'S NEW SPACE POLICY, WHICH I DISCUSSED WITH THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS LAST AUGUST. I SAID AT THAT TIME THAT WE WERE DETERMINED TO TAKE ADVANTAGE OF THE SUPERB CAPABILITIES OF THE SPACE SHUTTLE FOR A NEW GENERATION OF RESEARCH AND APPLICATIONS IN SPACE. WE'VE ALL TAKEN GREAT PRIDE IN THE CONTINUED SUCCESS OF THE SHUTTLE PROGRAM, INCLUDING THE FIRST LAUNCH OF COMMERCIAL PAYLOADS IN 1982. THIS YEAR WE EXPAND THE OPERATIONAL FLEET TO TWO ORBITERS, AND WE INTEND TO PROVIDE THE NECESSARY FUNDING TO ENSURE THE FUTURE OPERATION OF A FOUR-ORBITER FLEET--WHICH IS ADEQUATE TO MEET CURRENT PROJECTED DEMANDS FOR LAUNCH CAPACITY.

OVER THE NEXT FEW YEARS THE SHUTTLE, AND ITS HIGH-ENERGY

UPPER STAGE, WILL BE THE CENTERPIECE OF A VARIETY OF TRULY EXCITING NEW SCIENTIFIC SATELLITES. MANY OF THOSE HAVE BEEN UNDER DEVELOPMENT FOR SEVERAL YEARS NOW, SUCH AS THE SPACE TELESCOPE OR THE GALILEO JUPITER SPACECRAFT. BUT I WANT TO CALL YOUR ATTENTION TO OUR PROPOSED VENUS RADAR MAPPER AS AN EXAMPLE OF HOW NASA, DRAWING ON ITS EXPERIENCE AND SUCCESSES, HAS BEEN ABLE TO REDUCE THE COMPLEXITY AND COSTS OF PLANETARY PROGRAMS AND STILL ACHIEVE MAJOR SCIENTIFIC OBJECTIVES.

LATE IN 1982 WE ALSO COMPLETED OUR REVIEW OF THE FEDERAL ROLE IN AERONAUTICS RESEARCH AND TECHNOLOGY. DR. VICTOR REIS OF OSTP DISCUSSED THAT STUDY WITH THE SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS. THIS TURNED OUT TO BE AN AREA WHERE THE ADMINISTRATION AND THIS COMMITTEE WOUND UP IN STRONG AGREEMENT ON PRIORITIES AND OPPORTUNITIES. YOU'LL FIND IMPLEMENTATION OF THAT AERO POLICY IN BOTH THE NASA AND DEFENSE R&D PROGRAMS FOR FY 1984.

MR. CHAIRMAN, I'M VERY PROUD OF THE ABILITIES AND ACCOMPLISHMENTS OF MY STAFF AND OF THE MANY PEOPLE FROM OTHER FEDERAL ORGANIZATIONS WHO HAVE CONTRIBUTED SO MUCH TO STUDIES LIKE THE TWO I JUST MENTIONED. BUT I'M ALSO DELIGHTED TO POINT TO THE ACHIEVEMENTS OF THE WHITE HOUSE SCIENCE COUNCIL, A GROUP OF 13 DISTINGUISHED ACADEMIC AND INDUSTRIAL SCIENTISTS WHOSE INVESTIGATIONS

AND ADVICE HAVE PROVEN TO BE INVALUABLE TO ME.

ONE PARTICULAR WHSC STUDY--A THOROUGH REVIEW OF OUR FEDERAL LABORATORIES--IS NOW NEARLY COMPLETE. ALTHOUGH I WON'T PRESUME TO ANTICIPATE THE PANEL'S FINAL CONCLUSIONS, OUR INTERACTIONS SO FAR SUGGEST TO ME THAT THEY'RE FINDING SEVERAL IMPORTANT AREAS IN WHICH THE LABS CAN PROVIDE EVEN GREATER SERVICE TO THE NATION. INDICATIONS ARE THAT THIS RESOURCE, WHICH CLAIMS ABOUT ONE-THIRD OF THE ENTIRE FEDERAL R&D BUDGET, CAN CONTRIBUTE SUBSTANTIALLY TO OUR NATIONAL NEEDS IN DEFENSE AND CIVILIAN TECHNOLOGY--AND THAT WE SHOULD FIND BETTER WAYS TO MAKE THAT HAPPEN.

IN ADDITION TO OUR EMPHASIS ON GROWTH IN UNIVERSITY RESEARCH TO STRENGTHEN THE KNOWLEDGE AND PERSONNEL FOUNDATION FOR FUTURE INDUSTRIAL NEEDS, THE ADMINISTRATION HAS CONTINUED TO PURSUE OTHER, NON-BUDGETARY ACTIONS AS PART OF ITS POLICIES TO IMPROVE THE CLIMATE FOR PROGRESS IN INDUSTRIAL TECHNOLOGY. WE'VE FOCUSED EFFORTS IN THE PAST YEAR IN THREE ADDITIONAL AREAS.

THE PATENT OFFICE, UNDER THE ABLE HAND OF COMMISSIONER MOSSINGHOFF, HAS EMBARKED ON A PLAN TO COMPUTERIZE ITS OPERATIONS; THAT WILL SIGNIFICANTLY REDUCE THE TIME INVOLVED IN PATENT PROCESSING. IN THE PAST YEAR THE CONGRESS HAS ALSO MADE IMPORTANT CONTRIBUTIONS IN THE

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PASSAGE OF LEGISLATION THAT FACILITATES VOLUNTARY ARBITRATION OF PATENT DISPUTES.

THE ADMINISTRATION BELIEVES TRADITIONAL ANTI-TRUST POLICY HAS BEEN UNNECESSARILY RESTRICTIVE IN PREVENTING INDUSTRIES FROM POOLING RESOURCES FOR R&D. GUIDELINES ARE IN PREPARATION THAT WILL PERMIT GREATER INDUSTRIAL PARTICIPATION IN LONG-TERM, HIGH-RISK RESEARCH. THIS IS ANOTHER EXAMPLE OF TRYING TO ENCOURAGE INSTITUTIONS TO BROADEN THEIR R&D, TO TAP INTO THAT RICH POTENTIAL THAT LIES BETWEEN SECTORS.

THE THIRD AREA CONCERNS REGULATION. IT'S NO SECRET THAT THE ADMINISTRATION BELIEVES THAT, IN GENERAL, GOVERNMENT IMPOSES UNNECESSARY AND EXPENSIVE BURDENS ON BOTH INDIVIDUALS AND INSTITUTIONS. MY OFFICE HAS BEEN LOOKING SPECIFICALLY AT REGULATIONS DEALING WITH ENVIRONMENTAL AND HUMAN SAFETY, WHICH ARE OSTENSIBLY BASED ON TECHNICAL CONSIDERATIONS--THAT IS, SOME CONCEPT OF DETECTABLE RISKS AND HAZARDS. BUT LAWS AND REGULATIONS TEND TO GET STUCK IN TIME, AND SCIENTIFIC UNDERSTANDING AND TECHNIQUES RACE QUICKLY AHEAD.

THERE ARE TWO CONSEQUENCES. FIRST, EACH YEAR WE'RE CAPABLE OF DETECTING SMALLER AMOUNTS OF PROHIBITED SUBSTANCES THAN THE ORIGINAL REGULATIONS ENVISIONED, SO AN

ESSENTIALLY UNCHANGED PHYSICAL ENVIRONMENT CAN NONETHELESS GROW MORE HAZARDOUS BY LEGAL DEFINITION YEAR BY YEAR. SECOND, ADVANCES IN KNOWLEDGE CAN PERMIT INCREASINGLY PRECISE CHARACTERIZATION OF THOSE HAZARDS WE OUGHT TO BE HIGHLY CONSCIOUS OF AND ALLOW US TO MODIFY UNNECESSARY CONTROLS ON OTHERS. THE RESULT WOULD BE GREATER PUBLIC SAFETY AND, PERHAPS, LESS OVERHEAD COST TO THE PUBLIC WHO, ULTIMATELY, PAY FOR REGULATION.

THIS YEAR OSTP HAS BEGUN THE DIFFICULT TASK OF MAKING AN ASSESSMENT OF CURRENT SCIENTIFIC KNOWLEDGE ABOUT HUMAN CARCINOGENS. OUR GOAL IS TO THEN DEVELOP POLICY GUIDELINES THAT WILL IMPROVE THE SCIENTIFIC BASIS FOR CARCINOGEN REGULATIONS THAT IMPACT WIDELY ON INDUSTRY, GOVERNMENT, AND EVERY ONE OF US. NEEDLESS TO SAY, THIS IS PROVING TO BE A CHALLENGE, BUT WE SEE THIS PROCESS AS A MODEL FOR DOING SIMILAR UPDATES IN OTHER AREAS OF REGULATION.

THIS CHALLENGE TO FOCUS OUR ATTENTION ON THE TRULY SERIOUS THREATS--RATHER THAN SPREAD OUR VIGILANCE UNNECESSARILY BROADLY--COMES UP IN OTHER KINDS OF REGULATED ACTIVITIES. WE'RE TRYING NOW TO APPLY A SIMILAR KIND OF SELECTIVE ATTENTION TO PROBLEMS OF CONTROLS ON THE EXPORT OF STRATEGIC TECHNOLOGIES AND SCIENTIFIC INFORMATION. AGAIN, THE CHALLENGE IS TO IDENTIFY THOSE TECHNOLOGIES WHOSE

LOSS WOULD SERIOUSLY COMPROMISE OUR SECURITY, THEN RIGOROUSLY PROTECT THEM WITHOUT UNNECESSARILY IMPEDING THE FREE FLOW OF SCIENTIFIC COMMUNICATION. BUT TRYING TO APPLY CONTROL REGULATIONS BROADLY ALMOST GUARANTEES A SYSTEM VULNERABLE TO FAILURE. IN ADDITION TO THE ADMINISTRATION'S ONGOING WORK THROUGH COCOM TO SECURE AGREEMENT AMONG OUR ALLIES ON A BETTER ENFORCEMENT STRATEGY, OSTP IS CURRENTLY WORKING WITH THE NATIONAL SECURITY COUNCIL TO DEVELOP A REALISTIC POLICY ON SCIENTIFIC COMMUNICATION AND NATIONAL SECURITY.

LET ME MENTION ONE OTHER AREA OF ACTIVITY BEFORE I DISCUSS THE PROPOSED FY 1984 PROGRAMS. OSTP HAS LED ADMINISTRATION EFFORTS TO EXPLORE OPPORTUNITIES FOR SHARING SOME OF THE COSTS AND RESOURCES FOR RESEARCH WITH OTHER NATIONS WHO ARE WORKING ALONG PARALLEL TRACKS. IN THE PAST YEAR, AS A CONSEQUENCE OF TH JULY 1982 VERSAILLES SUMMIT, WE'VE BEEN HOLDING DISCUSSIONS WITH WESTERN EUROPEAN NATIONS AND JAPAN ON SHARED RESEARCH IN SUCH AREAS AS FUSION, HIGH-ENERGY PHYSICS FACILITIES, AND PLANETARY EXPLORATION. OSTP IS ALSO DIRECTING THE EFFORT TO ESTABLISH GREATER COOPERATION WITH INDIA IN RESEARCH ON FOOD PRODUCTION, HEALTH, BIOMASS FOR ENERGY, AND MATERIALS SCIENCES. THIS EFFORT GREW OUT OF DISCUSSIONS BETWEEN PRESIDENT REAGAN AND PRIME MINISTER GANDHI DURING HER U.S. VISIT LAST JULY. WE ALSO CONTINUE TO WORK TOWARD EXPANDED

SCIENTIFIC INTERACTION WITH THE PEOPLE'S REPUBLIC OF CHINA.

MR. CHAIRMAN, THE COMPLETE BUDGET PROPOSAL, AS WELL AS THE SPECIAL ANALYSIS ON RESEARCH AND DEVELOPMENT, PROVIDE A DETAILED DESCRIPTION OF HOW THE ADMINISTRATION IS IMPLEMENTING ITS POLICY PRIORITIES IN THE NEXT FISCAL YEAR. I'M SURE THAT THE COMMITTEE, IN STUDYING THOSE PROPOSALS OVER THE COMING MONTHS, WILL PARTICULARLY SCRUTINIZE THE SUBSTANTIAL GROWTH WE'RE PROPOSING IN MANY AREAS OF R&D. IN LIGHT OF THE CURRENT ECONOMIC CRISIS, AND THE NEED TO REDUCE THE FEDERAL DEFICIT, YOU'LL WANT TO ASSURE YOURSELVES THAT THESE INCREASES ARE NECESSARY AT THIS CRITICAL TIME. I THINK THE TESTS OF THEIR NECESSITY ARE SIMPLE ONES: WHAT IMPACT WILL THOSE INCREASES HAVE ON THE NATION'S LONG-TERM ECONOMIC REVITALIZATION? WILL THEY TRULY IMPROVE THE ABILITY--AND CLIMATE--FOR S&T INSTITUTIONS AND PERSONNEL TO CONTRIBUTE TO OUR NATION'S LONG-TERM ECONOMIC REVITALIZATION?

I CAN GIVE YOU OUR ANSWER TO THOSE QUESTIONS. WE'RE CONVINCED THAT THOSE AREAS OF R&D PROJECTED FOR GROWTH WILL MAKE IMPORTANT CONTRIBUTIONS TO AMERICA'S TECHNOLOGICAL LEADERSHIP IN COMING YEARS. WE EXPECT TO REAP A HARVEST OF INNOVATION AND TRAINED PEOPLE FROM THIS INVESTMENT. THEIR IMPACT WILL BE MEASURED IN FUTURE IMPROVED COMPETITIVENESS OF OUR INDUSTRIES, IMPROVED BALANCE OF TRADE,

AND CREATION OF NEW JOBS FOR AMERICAN WORKERS.

I WANT TO MAKE CLEAR THAT WE'RE NOT PROPOSING A GENERAL INFUSION OF FEDERAL FUNDS INTO R&D, EVEN THOUGH MANY AREAS HAVE BEEN CONSISTENTLY UNDERFUNDED OVER THE PAST DECADE. NO, THE GROWTH IS SELECTIVE. IT'S GUIDED BY BOTH INTELLECTUAL OPPORTUNITY AND LONG-TERM RELEVANCE TO INDUSTRIAL NEEDS. IT'S DECIDEDLY NOT SCIENCE FOR SCIENCE'S SAKE. MOREOVER, EVEN IN THOSE TARGET AREAS OF HIGH OPPORTUNITY, OUR INTENT IS NOT TO SIMPLY BEEF UP A FIELD BY INCREASING THE NUMBER OF PROJECTS--BY FUNDING THE NEXT-BEST 10 OR 15 PERCENT OF THE PROJECTS THAT HAD TO BE TURNED DOWN IN PREVIOUS LEAN YEARS. THE REAL RETURN ON THIS ADDED INVESTMENT WILL COME FROM CONCENTRATION ON THE VERY BEST PROJECTS WE CAN IDENTIFY--AND BY PROVIDING ENOUGH FUNDING TO PERMIT THOSE NUCLEI TO GROW INTO WORLD-LEADING CONCENTRATIONS OF RESEARCH EXCELLENCE. THIS APPROACH WILL NOT NECESSARILY BE POPULAR WITH THE BROAD R&D COMMUNITY, WHICH MAY EXPECT THIS GROWTH IN R&D TO BE A RESPONSE TO CONSTRAINED FUNDING OVER THE YEARS. BUT OUR RESPONSIBILITIES ARE GRAVE THESE DAYS, AND WE HAVE TO CHANNEL RESOURCES TO THOSE PLACES WHERE WE THINK THEY'LL HAVE THE GREATEST IMPACT.

LET ME ILLUSTRATE THIS APPROACH WITH A COUPLE OF EXAMPLES.

NEW TECHNOLOGY IS INCREASINGLY BEING BUILT ON ADVANCES IN MATERIALS--FINELY TOOLED SEMICONDUCTORS FOR MICROELECTRONICS, NEW ALLOYS AND CERAMICS FOR HIGH PERFORMANCE ENERGY CONVERSION, POLYMERS AS REPLACEMENTS FOR STRUCTURAL METALS. WE'RE ENTERING AN ERA IN WHICH WE'LL NOT ONLY SHIFT AWAY FROM RELIANCE ON INCREASINGLY SCARCE NATURAL MATERIALS, BUT IN WHICH WE CAN PROCESS COMMON RAW MATERIALS INTO EXOTIC NEW COMPOUNDS WITH ASTOUNDING PERFORMANCE. TOMORROW'S HIGH-TECHNOLOGY MARKETPLACE WILL BE INFUSED WITH THOSE NEW MATERIALS.

WE SEE AN EXCITING POSSIBILITY HERE TO CAPITALIZE ON AMERICAN EXPERTISE WITH THE DEVELOPMENT OF A NATIONAL ADVANCED MATERIALS RESEARCH CENTER AT LAWRENCE BERKELEY LABORATORY. LBL, WHICH IS A SUPERB DEPARTMENT OF ENERGY LABORATORY LOCATED AT THE UNIVERSITY OF CALIFORNIA, HAS RECOGNIZED THREE THINGS. FIRST, SCIENCE HAS MADE ENOUGH PROGRESS IN RECENT YEARS TO BRING A VARIETY OF DISCIPLINES TO A NEW THRESHOLD IN UNDERSTANDING MATERIALS. SECOND, THE POTENTIAL APPLICATIONS OF THIS KNOWLEDGE, AS IT'S DEVELOPED, WOULD SPREAD THROUGHOUT OUR HIGH-TECHNOLOGY INDUSTRIES. AND THIRD, THIS IS AN AREA OF BASIC SCIENCE IN WHICH THE UNITED STATES NOW HOLDS A DECISIVE WORLD LEAD THAT CAN BE BROADLY EXTENDED.

ALTHOUGH THE INITIAL FUNDING FOR THIS CENTER WILL BE

LARGELY FEDERAL, WE ALREADY KNOW OF WIDE INDUSTRIAL INTEREST IN WORKING WITH LBL AS THE CENTER DEVELOPS. WE SEE THIS FACILITY AS A CRUCIBLE FOR ESTABLISHING NEW MEANS OF UNIVERSITY/ FEDERAL LABORATORY/INDUSTRY INTERACTION AND COOPERATION. WE'RE VERY ENTHUSED AT THE PROSPECTS FOR SUCCESS AT LBL.

IN ANOTHER AREA, YOU'LL NOTICE THAT WE'RE PROPOSING HEALTHY INCREASES IN MANY OF THE NATIONAL SCIENCE FOUNDATION PROGRAMS FOR THE COMING YEAR. THESE REFLECT BOTH THE RESEARCH OPPORTUNITIES I'VE ALREADY DISCUSSED, AND ALSO THE MISSION OF NSF, WHICH IS TO SUPPORT BASIC RESEARCH IN THE NATION'S UNIVERSITIES--WHICH REQUIRE SPECIAL ATTENTION.

IN SPITE OF THE FEDERAL INVESTMENT IN BASIC RESEARCH OVER THE PAST TWENTY YEARS, OUR ACADEMIC INSTITUTIONS ARE GROWING SHABBY--AT LEAST IN THE AREAS OF PHYSICAL SCIENCES AND ENGINEERING--PARTLY BECAUSE AN INORDINATE SHARE OF THAT SUPPORT HAS GONE TO OTHER INSTITUTIONS, PARTICULARLY FEDERAL LABORATORIES. WITH FEW EXCEPTIONS UNIVERSITIES HAVE BECOME LESS AND LESS ATTRACTIVE PLACES TO PURSUE RESEARCH CAREERS IN THOSE FIELDS. INADEQUATE EQUIPMENT AND INSTRUMENTATION ARE LIMITING THE QUALITY OF BOTH RESEARCH AND EDUCATION. SALARIES FOR YOUNG FACULTY ARE SO LOW THAT MANY OF THE BRIGHTEST NEW RESEARCHERS

FOREGO WHAT, NOT MANY YEARS AGO, WOULD HAVE BEEN THEIR PREFERRED CAREER CHOICES. WHEN I HEAR THE PRESIDENT OF MIT COMPLAINING THAT HE CAN'T FIND QUALIFIED APPLICANTS FOR SOME ENGINEERING FACULTY POSITIONS, I KNOW WE ALL HAVE A PROBLEM.

MOREOVER MANY OF THE BEST UNIVERSITY RESEARCH PROJECTS HAVEN'T BEEN FUNDED AT HIGH ENOUGH LEVELS TO TAKE FULL ADVANTAGE OF THEIR POTENTIAL. SOMEHOW WE'VE ARRIVED AT THE INDEFENSIBLE POSITION OF CREATING THE POOREST CLIMATE FOR RESEARCH IN THE PLACE THAT OUGHT TO HAVE THE BEST. THAT HAS TO BE CHANGED, BOTH TO PROTECT THE WORLD-LEADING BASIC RESEARCH CAPABILITY WE'VE BUILT UP OVER THREE DECADES--AND TO MAKE SURE THE UNIVERSITIES CAN UPHOLD THE HIGH STANDARDS FOR EDUCATION THAT WE'VE COME TO RELY ON FROM THEM.

I WANT TO DWELL ON THIS CRITICAL PROBLEM OF EDUCATION, BECAUSE IT UNDERLIES THE FUTURE OF OUR WHOLE CIVILIAN AND DEFENSE R&D CAPABILITIES. WE CAN'T LOSE SIGHT OF THE SINGLE MOST ESSENTIAL INVESTMENT FOR OUR FUTURE--THE EDUCATION OF TODAY'S YOUTH TO BECOME TOMORROW'S TALENT. BY FAR THE MOST IMPORTANT PART OF THAT TRAINING TAKES PLACE BY PARTICIPATION IN UNIVERSITY BASIC RESEARCH, AS GRADUATE STUDENTS PROGRESS FROM NOVICE RESEARCHERS TO NEW SCIENTISTS AND ENGINEERS READY TO TAKE THEIR

PLACES IN UNIVERSITIES, INDUSTRY, AND FEDERAL LABORATORIES. THIS SALIENT FACT GIVES ADDED VALUE TO RESEARCH FUNDED IN UNIVERSITIES, AND IT ACCOUNTS TO AN IMPORTANT EXTENT FOR THE EMPHASIS ON FEDERAL FUNDING OF RESEARCH THROUGH THE NATIONAL SCIENCE FOUNDATION.

IN FISCAL YEAR 1983 NSF GRANTS SUPPORTED APPROXIMATELY 9600 GRADUATE STUDENTS IN SCIENCE AND ENGINEERING. THE LEVEL OF FUNDING WE PROPOSE FOR FY 1984 WILL SUPPORT 10,400 OF THOSE STUDENTS, WHO WILL THEN BE AVAILABLE FOR THE LARGE S&T INDUSTRIAL PERSONNEL NEEDS PROJECTED FOR THE END OF THE DECADE AND BEYOND. WE'RE DETERMINED THAT THE UNITED STATES WILL FACE COMING TECHNOLOGICAL CHALLENGES WITH THE WORLD'S STRONGEST RESEARCH AND TRAINING ENTERPRISE.

AT THE SAME TIME WE'RE AWARE THAT AN IMPORTANT PART OF OUR EDUCATIONAL SYSTEM IS INCREASINGLY COMPROMISED BY THE WORSENING ABILITY OF UNIVERSITIES TO COMPETE WITH INDUSTRY FOR TECHNICALLY TRAINED PEOPLE--NOTABLY RECENT PHDS FOR ENTRY-LEVEL FACULTY POSITIONS. IN THE PAST YEAR WE'VE BEEN CONSULTING WITH MANY PROFESSIONAL GROUPS AND UNIVERSITIES ABOUT THIS PROBLEM, WHICH HAS ALSO BEEN A FOCUS OF THIS COMMITTEE. OUR COMMON CONCERN IS TO FIND WHERE THE FEDERAL GOVERNMENT CAN APPLY RESOURCES AND LEADERSHIP

TO INITIATE SOME NEEDED IMPROVEMENTS IN SCIENCE AND ENGINEERING EDUCATION.

WE'VE NOW DEVISED SEVERAL SPECIFIC NEW PROGRAMS TO ADDRESS WHAT WE FEEL IS THE MOST CRITICAL PROBLEM: THE INADEQUATE SUPPLY OF NEW JUNIOR ENGINEERING AND SCIENCE FACULTY IN UNIVERSITIES--AND THE SHORTAGE OF QUALIFIED SECONDARY SCHOOL SCIENCE AND MATH TEACHERS.

ONE PROGRAM, CALLED PRESIDENTIAL YOUNG INVESTIGATOR AWARDS AND ADMINISTERED BY NSF, WILL ATTRACT RECENT PHDS TO UNIVERSITY RESEARCH WHO MIGHT OTHERWISE CHOOSE NON-TEACHING CAREERS IN INDUSTRY. OUTSTANDING YOUNG INVESTIGATORS WILL BE ELIGIBLE FOR UP TO FIVE YEARS OF RESEARCH SUPPORT UNDER THIS PROGRAM, UP TO $100,000 PER YEAR OF SHARED FEDERAL AND PRIVATE SUPPORT. THIS MATCHING PROVISION WILL PROVIDE SOME EXTERNAL INFLUENCE ON THE FIELDS OF SCIENCE AND ENGINEERING THAT WILL BE EMPHASIZED, REFLECTING HIGH PRIORITY NEEDS OF INDUSTRIAL PARTICIPANTS. THE UNIVERSITIES WOULD PAY THE FACULTY MEMBER'S SALARY, SO THE ENTIRE AWARD AMOUNT WOULD BE AVAILABLE FOR RESEARCH. WE ENVISION UP TO 200 NEW AWARDS EACH YEAR; WITHIN FIVE YEARS THERE WOULD BE ONE THOUSAND YOUNG FACULTY--A SIGNIFICANT PORTION OF THE NATION'S UNIVERSITY RESEARCH FACULTY--IN THE PROGRAM.

THERE ARE ALSO SEVERAL PROGRAMS AIMED AT SHORTAGES OF QUALIFIED SCIENCE AND MATH TEACHERS IN SECONDARY SCHOOLS. ONE IS A PROGRAM IN NSF TO PERMIT CURRENT SCIENCE AND MATH TEACHERS TO UPGRADE THEIR SUBJECT MATTER SKILLS THROUGH UNIVERSITY COURSES. OVER A PERIOD OF THREE TO FIVE YEARS, THE PROGRAM WOULD BUILD UP TO ABOUT 10,000 PARTICIPANTS PER YEAR. THIS PROGRAM ALSO REQUIRES MATCHING NON-FEDERAL FUNDS. A COMPANION PROGRAM IN THE DEPARTMENT OF EDUCATION WILL PROVIDE BLOCK GRANTS TO LOCAL SCHOOL DISTRICTS TO PERMIT THEM TO TRAIN ADDITIONAL TEACHERS IN MATH AND SCIENCE. THESE WOULD INCLUDE TEACHERS CURRENTLY IN OTHER DISCIPLINES, RETIRED TEACHERS, AND INDIVIDUALS IN BUSINESS AND INDUSTRY. APPROXIMATELY 30,000 TEACHERS COULD BE TRAINED UNDER THIS PROGRAM OVER A FOUR-YEAR PERIOD. THERE WILL ALSO BE A HIGHLY VISIBLE PRESIDENTIAL SCIENCE AND MATHEMATICS TEACHING AWARDS PROGRAM TO HONOR OUTSTANDING SCHOOL TEACHERS AND THEIR SCHOOLS AND TO EMPHASIZE THE NATIONAL IMPORTANCE OF GOOD SECONDARY SCHOOL PROGRAMS.

THE COSTS FOR THESE EDUCATION PROGRAMS WILL NOT BE GREAT, BUT BY CONCENTRATING RESOURCES STRICTLY WHERE THEY'RE MOST NEEDED--ON GOOD FACULTY--WE ANTICIPATE SUBSTANTIAL LONG-TERM BENEFITS.

WE ALSO SEE FY 1984 AS A TIME TO MAKE NEEDED INROADS ON

THE OTHER MAJOR UNIVERSITY RESEARCH PROBLEM--OUTMODED AND OBSOLETE RESEARCH EQUIPMENT AND INSTRUMENTATION. MOST OF THE ADDITIONAL SUPPORT FOR PURCHASE OF EQUIPMENT WILL BE INCLUDED IN THE FUNDS ALLOCATED FOR RESEARCH, RATHER THAN AS SEPARATE, COMPETING PROGRAMS. IN ALL, WE ESTIMATE THE PROPOSED LEVEL OF BASIC RESEARCH FUNDING WILL INCLUDE NEARLY $400 MILLION FOR PURCHASE AND REPLACEMENT OF INSTRUMENTATION.

MR. CHAIRMAN, I HAVE TRIED TO DESCRIBE HOW THE ADMINISTRATION INTENDS TO IMPLEMENT ITS SCIENCE AND TECHNOLOGY POLICY--AND HOW THAT POLICY IS RESPONSIVE TO THE VERY REAL PROBLEMS OUR NATION FACES AS THE LEADING INDUSTRIAL FORCE IN THE WORLD. MY FOCUS ON PROGRAMS RATHER THAN ON NUMBERS REFLECTS MY STRONG CONVICTION THAT OUR SUCCESS WILL BE MEASURED BY HOW WISELY WE USE WHATEVER RESOURCES ARE AVAILABLE, NOT BY HOW MUCH WE SPEND.

NEVERTHELESS, I RECOGNIZE THE INTEREST IN COMPARING LEVELS OF EXPENDITURES, SO LET ME MAKE JUST A FEW COMMENTS ABOUT THE DATA THAT APPEAR IN THE SPECIAL ANALYSIS OF THE R&D PORTION OF THE BUDGET.

YOU WILL NOTE THAT THE COMPARISONS BETWEEN BASIC RESEARCH IN FY 1983 AND 1984 ARE DOMINATED BY TWO THINGS: THE LARGE INCREASES IN THE PHYSICAL SCIENCES AND ENGINEERING--SOME 15 PERCENT OVER ONE YEAR--AND THE INCREASE OF ABOUT

3 PERCENT FOR THE LIFE SCIENCES. THE LIFE SCIENCES, A VERY PRODUCTIVE AND RICH AREA OF RESEARCH, HAVE EXPERIENCED A HIGH GROWTH RATE SINCE THE MID-1960'S. THAT GROWTH FAR EXCEEDED THAT FOR THE INCREASINGLY CONSTRAINED PHYSICAL SCIENCES UPON WHICH OUR INDUSTRIES SO DEPEND. TODAY THE LIFE SCIENCES ARE VERY HEALTHY, AND THE SMALLER INCREASES WON'T AFFECT THEIR VITALITY. IN A CLIMATE OF INTENSE FISCAL SCRUTINY, IT'S NO LONGER POSSIBLE TO SPREAD INCREASES UNIFORMLY THROUGHOUT SCIENCE. GIVEN THE RESOURCES ALREADY COMMITTED TO THE LIFE SCIENCES OVER THE YEARS, WE'RE CONFIDENT THAT THE MOST PROMISING RESEARCH IN THOSE FIELDS WILL CONTINUE TO BE WELL SUPPORTED. WE NOW HAVE TO CONCENTRATE ON THOSE AREAS IN THE PHYSICAL SCIENCES AND ENGINEERING THAT HAVE BEEN NEGLECTED, YET WHICH PROMISE GREAT RETURN TO OUR FOREMOST NATIONAL PRIORITIES--INDUSTRIAL ADVANCES TO FUEL OUR ECONOMY, AND DEFENSE.

I BELIEVE FY 1984 CAN BE A PIVOTAL YEAR FOR FEDERAL PROGRAMS IN R&D. THE ADMINISTRATION HAS WORKED LONG AND HARD TO STRUCTURE A SCIENCE AND TECHNOLOGY POLICY THAT ADDRESSES CRITICAL NEEDS IN OUR SOCIETY. THE PROGRAMS PRESENTED TO YOU REPRESENT OUR IMPLEMENTATION OF THAT POLICY. THE ADMINISTRATION IS ANXIOUS TO WORK WITH THE CONGRESS TO SET THE COUNTRY ON A PRODUCTIVE COURSE TO MAKE THE BEST POSSIBLE USE OF THE RESOURCES AND POTENTIAL OF OUR UNIVERSITIES, FEDERAL LABORATORIES, AND INDUSTRIAL ENTERPRISE.

MR. CHAIRMAN, THIS CONCLUDES MY FORMAL PRESENTATION. I WOULD BE HAPPY TO RESPOND TO QUESTIONS FROM MEMBERS OF THE COMMITTEE.

Mr. FUQUA. Thank you very much, Dr. Keyworth. I want to start out by saying that this is about a 180-degree turn in this presentation from what it has been in previous years, and I hope that whether you want to or not, maybe you can take some of the credit for it.

I think the administration has addressed some very fundamental questions. I noticed in the budget briefing this special analysis back in the case section for research and development, where you talk about a new center for materials research at Lawrence Berkeley, the expansion of the synchatron light source; the aerodynamic simulation at Ames. You go on and talk about attracting high caliber scientists and engineers, particularly young faculty members, into research, and encourage support for their careers; creative interaction; upgrade scientific research in universities; using the NSF and DOD to improve teaching of science and math in the Nation's secondary schools.

Those are things we have been talking about for some time that needed attention.

We have tried to attract that. I think this is very constructive, to have it in the budget books. I give you credit, blame, whatever, that it is in there.

I think it is very good and it certainly indicates a commitment, as I interpret it, that the administration and the other agencies are planning to really support some of these things that we need very much for our well-being, and, as you outlined in your statement, you also mentioned the need for Federal programs to insure technically trained personnel.

In addition to university research, what other programs would you suggest to encourage young people to get a technical education; and how do we encourage more math and science teachers?

Dr. KEYWORTH. Mr. Chairman, I think we have all come to realize how enormously complex this problem is of stimulating interest in science and math in pre-college-age children. I think personally the singlemost important thing we can do is attempt to restore education, particularly in science, mathematics, and I might also add foreign languages, as the highest possible priority responsibility for a parent.

What we have tried to do, as I am sure you realize, is generate programs—within the National Science Foundation and the Department of Education—that will provide exactly that stimulus.

With more than, if I recollect, $100 billion spent each year in the United States on precollege education, it is not an issue that is going to be addressed by a Federal program alone, but awareness is increasing.

There have been innovative programs in several states, including California.

I think it is becoming a higher and higher priority national need, and I think we are both trying to lead and respond to that important issue right now.

Mr. FUQUA. Thank you.

Mr. Sensenbrenner?

Mr. SENSENBRENNER. Thank you, Mr. Chairman. I would like to follow up on the Chairman's questions relative to the secondary school math and science education program.

The Subcommittee on Science Research and Technology had a number of hearings on that subject over the past 1½ years. One of the things that we heard again and again was that secondary school teacher salary structures were such that the good math and science teachers jumped off to a substantially higher paying job in private industry, thereby leaving the mediocre and poor science and math teachers teaching the kids.

Given the philosophy of local control of education and local negotiation of teachers' salary contracts, how does the administration's proposal address this problem?

Dr. KEYWORTH. Thank you, Mr. Sensenbrenner. I think you really bring out the key issue in the rather general response I gave.

What we have tried to do is to provide, literally, presidential recognition to top teachers in mathematics and science. It is leadership and stimulus, but it is not by itself going to rectify the problem.

The real problem, as you said yourself, is the fact that precollege public schoolteachers are paid at an absolutely unacceptably low rate.

It is going to have to be taken care of at the State and local government level. I think there has been very little question about that. By the stimulus that we are trying to provide in our programs here, we will help to stimulate that, but not solve it.

Mr. SENSENBRENNER. I agree with you. I would like to make another point. Most of the contracts that are negotiated between school boards and teachers' unions set forth a uniform salary structure for teachers with x number of years of service, regardless of what they teach, whether it is the first grade or physical education or calculus or advanced physics.

That really puts at a substantial disadvantage those teachers that do have skills that are marketable outside of the educational community.

I think we all recognize the problem; we are all very short on solutions since obviously the Federal Government is not going to be taking over paying higher salaries to good math and science teachers all around the country.

Dr. KEYWORTH. Let us draw an analogy for a second. We face the same problem in engineering schools, where traditionally engineering faculty have been paid the same as everyone else—with the exclusion, of course, of the two precedents, the members of the legal and medical professions.

In the last 2 years we have seen a major change in a large number of American universities, which are providing incremental salary increases for engineering faculty to react to the supply and demand to which you are referring.

Clearly, the same thing is warranted in precollege education, and it will be interesting to see what happens in the next year or two as a large number of States are beginning to wrestle with this problem.

Mr. SENSENBRENNER. Thank you very much.

Mr. FUQUA. Mr. Brown?

Mr. BROWN. Thank you, Mr. Chairman.

Dr. Keyworth, let me begin by seconding the remarks of the Chairman and Mr. Sensenbrenner with regard to the changes that we have perceived in addressing some of the science policy issues.

I think it is fairly commendable that the administration is recommending a dynamic approach to some of the problem areas such as science education and university laboratory obsolescence in this budget.

I don't need to tell you how much the committee members are gratified at that, and obviously we feel that your input has been helpful. That doesn't exhaust all of the good things that are in the budget, but it would not be my proper role just to focus on the good things, would it?

You have commented in our statement the need to redress the 20-year imbalance in defense exenditures and the large proportion of the R&D budget that is now occupied by defense.

I think an analysis or review of special analysis case shows level funding on civilian-oriented R&D for the last 3 years of about $15 billion and a very rapid growth in military R&D during that same period, up—what is the figure there on military R&D?

Well, it is a very large figure; about twice as much or more than the civilian. I don't have the numbers right here before me.

The breakdown on that shows that a good part of that—maybe half—is associated with the MX and the Trident.

Of course, if you believe in the MX and Trident, that is very important R&D; but, if Congress were to scrap both of those programs, you wouldn't have very much left and we see the situation in its stark reality, which is that we are cutting civilian R&D substantially by the erosion of inflation, if nothing else; and we are spending a hell of a lot more on defense.

Do you think that that is going to solve the problems of this country?

Dr. KEYWORTH. Mr. Brown, I welcome the opportunity to respond, because that is an absolutely key question to understanding this proposed R&D budget.

First, let me agree with your observations. We are seeing a 29-percent increase in defense R&D.

Mr. BROWN. Real dollars?

Dr. KEYWORTH. Real dollars. Fortunately the inflation rate has been reduced sufficiently that the two are no longer substantially different. But the civilian R&D has not gone up. We have moved from a near 50/50 split between civilian and defense to a near two to one.

With reference to the Trident II, the D–5, and the MX missiles, I must say without those activities I think our problems will be much more serious than a problem of industrial competitiveness.

A nation severely stretched in a time of unilateral disarmament is a nation that lacks sufficient commitment to maintain itself as a strong nation. However, we must look carefully at what is happening within the civilian programs.

Last year, this year, and maybe for another year or two we have opportunities to shift funding from areas of development where our moneys have not been effectively or efficiently spent in the past to this area I will simply refer to as a Federal trust, this area of insuring tomorrow's technical manpower.

I agree with you that as the Nation's R&D total—that is defense, industry's commitment, and the Federal Government's civilian programs—grows, we must look at basic research, which is almost entirely federally funded, as the source of talent to fuel that R&D. In that sense basic research is going to have to continue to grow at a rate essentially the same as the total investment in R&D.

I think you are going to see a resurgence of wisely directed Federal civilian R&D.

Mr. BROWN. This is not the forum to argue with your assertions about whether or not those of us who favor a healthy or civilian R&D are engaged in unilateral disarmament or other aspects of our military philosophy, but I would point out that the numbers that are revealed in Special K shows this administration is spending as much on the Trident and MX R&D, so-called, as they are on all civilian R&D.

In my opinion, that is not an adequate balance. I recognize you disagree with that.

Let me ask you several specific questions.

You have initiated in the past year or so some special inquiries into aeronautical R&D. The results of that are thoroughly commendable in my view. You have underway an investigation of the Federal labs, thoroughly commendable in my view; you are working on scientific communication problems and whether we need restrictions on that.

In each of these cases the Congress would appreciate the opportunity to be consulted. One of them is already completed; the other two are in process.

Specifically, on the scientific communication and national security, I wouldn't want that study to be overwhelmed by the dogma that I perceive in the executive branch and it should have some external input to it.

Do you think there is any chance of that?

Dr. KEYWORTH. There is a chance that we will have communication with the Congress, but there is no chance that the dogma, as you refer to it, will be introduced here. I want to point out that a month or so ago the President was interviewed on the spur of the moment by a member of the press and asked about exactly this issue.

His response was that under no circumstances will we threaten the creative environment that makes our universities best. There may be special cases where some care has to be taken, but I really don't think America's academic research is going to come under intense scrutiny. There may be dogma in some corners, but dogma does not come from the White House.

Mr. BROWN. Thank you for that response.

Mr. FUQUA. Thank you, Mr. Brown.

Mr. Skeen?

Mr. SKEEN. Thank you, Mr. Chairman.

I want to welcome you, too, Dr. Keyworth. Also good to see a fellow New Mexican.

One of the things I was most impressed with was the President's mention of the quality of education initiative to encourage an improvement in the math and science instruction.

I am a little confused. During your testimony you spoke of some of these—the implementation of some of these programs as if it was in existence already or proposed. Could you differentiate a little for me on those programs that are in existence and working and those that you have proposed?

Dr. KEYWORTH. The bulk of the programs, Mr. Skeen, to which you have referred are new introductions in the fiscal 1984 budget. Our reason for not having put these in last year is really quite straightforward, especially if one has worked with the private sector, academic, and industrial groups to try to understand their input.

I don't think until the last 6 or 8 months anyone has been in any position to provide well-thought-out programs to address these needs. Last year—and in retrospect, I will say it is extremely fortunate—the Congress chose to, without definition, restore some of the funding within the National Science Foundation the administration chose to cut. We will now certainly use some of those restored funds to get an early start on some of these new programs.

What I have referred to here, Mr. Skeen, are new programs.

Mr. SKEEN. One other question. We recently dedicated a new high energy laser systems test facility at White Sands in New Mexico. I have become very interested in this technology. To what extent is the administration interested in the priorities of high energy laser systems?

By the way, I would like to mention along with the discussion that my colleague, Mr. Brown, was making, that it was emphasized during the dedication of this facility, first of all, it was a multiservice facility, which also included not only just a military application but nonmilitary; and those people interested in using that kind of test facility were certainly welcome to use it on a contract basis. And I think it is a far-reaching program and a new approach, in my view, to the way some of our military R&D establishments are used and that they are welcoming nonmilitary operators on these facilities, and so forth.

Also, along with that, to what extent does the administration coordinate these kinds of activities between such departments as DOD, DOE, and NASA?

Dr. KEYWORTH. I will avoid the temptation of making an excessively long response to that because this is an area I have been deeply involved in since I first came here.

More than 1 year ago the President asked me to set up a group in the White House Science Council, which at that time was being organized, to look at major new potential military technologies and, specifically, to look at the question of directed energy and high-energy lasers.

I think there is wide recognition within the government that a more concerted, consolidated, coordinated effort has got to develop. We have spent a lot of money so far, approximately a half a billion dollars throughout the entire government. There is a huge potential here, and we have to do a better job of realizing that potential.

The facility to which you refer, Mr. Skeen, is a first-class facility. It does provide us with a major new capability, and you will see in the next year a real effort within the community to do exactly the coordinating to which you were referring.

Mr. SKEEN. I want to commend the effort and you. Thank you for your testimony today. I am heartened by the entire dissertation. I appreciate your being here.

Thank you, Mr. Chairman.

Mr. BROWN. Mrs. Bouquard.

Mrs. BOUQUARD. Mr. Chairman, I ask permission in case I run over that I may submit questions to Dr. Keyworth for the record.

Mr. BROWN. Without objection.

Mrs. BOUQUARD. In all kindness, Dr. Keyworth, I really don't think this claim of strong support for Federal R&D is going to hold up under close scrutiny.

As I look at it, with an increase in the defense component, which is more than a $6.9 billion increase, then 17-percent increase in the National Science Foundation program, I think this means that the area where we do receive our technology development, the programs that drive technology transfer, civilian research, also NASA research, DOE, these programs have suffered a cut of over $600 million. Is that not correct, Dr. Keyworth?

Dr. KEYWORTH. Excuse me. The $600 million cut has occurred in which particular areas?

Mrs. BOUQUARD. In basic civilian research, the NASA programs, the programs in civilian R&D where we get our greatest technology transfers.

Dr. KEYWORTH. If you take a careful look at what was done in those programs, you'll see that we have not withdrawn funds from legitimate, productive basic research or civilian research that can drive industry into fanning an emerging defense. Take a good careful look. For example, the shuttle has——

Mrs. BOUQUARD. That's what I did, Dr. Keyworth. That's why I asked the question.

Dr. KEYWORTH. The shuttle has now moved into the operational phase. You will see there has been some cut, yes, in that aspect of NASA R&D. But you will also see a 13-percent increase in the utilization of the shuttle and new missions.

Mrs. BOUQUARD. I wasn't asking about specifics. I was saying those programs suffered a $600 million cut.

Dr. KEYWORTH. I am saying it occurred because we reached a level of maturity in the program.

Mrs. BOUQUARD. But you did have a $600 million cut?

Dr. KEYWORTH. It was reprograming. I never looked at it as a cut.

Mrs. BOUQUARD. How about fossil and solar conservation?

Dr. KEYWORTH. A cut, unquestionably a cut. I think you understand that we feel very strongly that those programs either are not appropriate for the Federal Government or are programs that represent ineffective use of Federal funds; we have tried to keep the components where we felt the program value was high and appropriateness was there.

Mrs. BOUQUARD. I would say again I think your statement of strong support for Federal R&D didn't really hold up. I want to know something about—did the DOE request funding for the National Center for Advanced Materials at Berkley from OMB? Who was responsible for this?

Dr. KEYWORTH. It was requested from the Department of Energy. I have a copy of a letter from the Secretary of Energy requesting that.

Mrs. BOUQUARD. I was going to ask you about the need for the advanced light source. It is my understanding there is some private development that is going to be moving into this area.

Dr. KEYWORTH. If you mean the additions to the national synchrotron light source at Brookhaven, that facility has been very, very heavily supported by the private sector.

On the other hand, that is also the flagship of American condensed matter science.

Mrs. BOUQUARD. I am thinking about a company in Houston.

Dr. KEYWORTH. A company in Houston?

Mrs. BOUQUARD. Yes, sir.

Dr. KEYWORTH. I am completely lost. I know of no private sector——

Mrs. BOUQUARD. I would like to pursue this with you further, if I may.

I would like to turn to the high temperature materials laboratory. It is my understanding this was originally specified to be at Oak Ridge and they made arrangements they would not need a building. Now it is unspecified instead of being assigned to ORNL.

It is my understanding this is to be funded out of the Transportation Energy Conservation Act. Is that correct?

Dr. KEYWORTH. Yes, I believe it is being funded out of conservation. I believe there is every intention that it be at Oak Ridge and no place other than at Oak Ridge.

Mrs. BOUQUARD. Who do you think is going to supply the operating funds? Will basic science pay the operating expense of this?

Dr. KEYWORTH. I cannot speak knowledgeably about the detailed mechanisms within the Department of Energy. I can only say I am certain the Department of Energy intends to provide the operating support.

Mrs. BOUQUARD. It is my understanding the $20 million will not be needed for a new building because arrangements have been made to house this in another building. When we are facing a $200 billion deficit, I think this is one area we could cut back on. I would like to pursue these additional questions with you.

Thank you, Mr. Chairman.

Mr. BROWN. Thank you.

Mr. Bateman.

Mr. SCHNEIDER. Mr. Chairman, are we going by order of appearance or seniority?

Mr. BROWN. We are going by order of appearance.

Mr. SCHNEIDER. Thank you. I didn't want to be overlooked.

Mr. BROWN. You didn't appear to the committee on time.

Mr. SCHNEIDER. Thank you.

Mr. BATEMAN. Dr. Keyworth, there has been some grumbling of commercialization of the weather satellite program that is conducted through the National Oceanographic and Atmospheric Agency. Have you and your colleagues of the Office of Science and Technology Policy been involved in those discussions? And is there any official administration position with regard to commercialization?

Dr. KEYWORTH. Certainly. First, I think it is fair for me to say we have taken the lead position on that issue, and I can certainly tell you the administration policy has been to try to promote as much possible private sector involvement in the space program, including the Landsat—and, as it is called, Metsat programs to which you are referring.

It has also been our responsibility to insure that the Federal Government's needs are insured. Right now we are in the process of doing our best to explore the specifics of private sector takeover of each of those individual space opportunities—Landsat, Metsat, and for that matter, launch services.

Mr. BATEMAN. May I ask a followup question in light of that answer? Do you regard Comsat as being a private sector phenomena? I find it a little different than the norm of the private sector. I wondered if you had observations on that?

Dr. KEYWORTH. Without trying to be facetious, I think I could say you and I look at the problem the same way. I think there is public sector, private sector, and something in between.

Mr. BATEMAN. Mr. Chairman, I would look forward to further discussions on the subject with the doctor in light of the responses to the question.

Thank you.

Mr. BROWN. Thank you, Mr. Bateman.

Mr. Mineta.

Mr. MINETA. Thank you, Mr. Chairman.

Dr. Keyworth, I am a new member of this committee, so you will have to excuse me as I try to grasp some of the fundamentals of what we are trying to deal with.

One of the concerns that I have is this whole area of renewed interest now in math, science, and foreign languages that you mentioned. I am wondering, is that from the perspective of just a national defense effort?

Dr. KEYWORTH. Not at all. It is primarily from looking forward several years and seeing what will be required to insure that this Nation's economy can grow and that the essential requirements will be met.

As we have done that, manpower, people, has more and more come to be the central issue. It is by no means dominated by defense.

In fact, if I may add a comment, I have appreciated the generous comments about our changes in policy. But let me assure you that the really important thing here is that what we have done arose from many, many, many meetings that the President chaired on the subject of this Nation's industrial competitiveness.

It was interesting, and will be interesting to most of you, I think, to observe that the lowest common denominator that arose from these discussions—which may have begun with trade or tax incentives, or whatever—was people: tomorrow's talent.

That is what we have attempted to address in this budget. Almost everything you see that represents a thrust area within the civil side either addresses people primarily for industrial growth for tomorrow or it addresses what we call the transfer of knowledge.

Mr. MINETA. I think that is important. I come from an area that I think is known for entrepreneurial skills and basic scientific development. It is known as Silicon Valley. Just as in 1982 the buzz word was infrastructure, it seems in 1983 the new buzz word is high technology.

The question is whether or not the new apostles of high technology are, in fact, converts, or is it a PR gimick? Are we really going to be dealing with the whole issue of trying to put public dollars into the area of basic research versus applied research? How does our public dollar leveraging in R&D leverage on the public and private sector to do certain things?

I would hope that it is not just one case of saying, yes, we are going to do basic research, but applied research is going to be private sector because the marketplace will determine that. The marketplace only determines that if there are economic returns; and there are many areas in which applied research may have long-term return implications that may never see the dollars going into them in applied research.

So it seems to me there are still areas of civilian R&D applied research efforts that we ought to still be concerned with and not just say, well, applied research really belongs in the commercial field and let it go.

I would hope that in your role—and I really do welcome the emphasis that is in this budget about going back to some of the basic areas and I commend you for that. But I would hope that it may not be just a clear basic applied private-public kind of delineation.

Dr. KEYWORTH. I think you will certainly see that the government has frequently dealt with this problem by semantics. For example, we call fusion research basic research; whereas it is a clearcut example of an applied research with a very clear objective. It is just very long term.

We do the same thing with materials research. It has an immediate application, much of it, but we call it basic research in order to put it on the white side.

I certainly agree with you. I feel a deep fear over what may happen as an overreaction to what is clearly a new emphasis on high technology in considering America's growth.

We do have to act wisely in both basic research and in those key areas of applied research.

Look at what we have chosen to do this year after a very careful review in aeronautics research. Even though it might have been better if American industry had been supporting a lot of that aeronautical research over the past 50 years, the fact is we have an industry that depends upon this Federal role. So we are continuing to support aeronautics research with vigor and enthusiasm and clear policy support from the President.

That is an applied area. I agree with you that the line is fuzzy. One cannot draw a clearcut distinction between basic and applied. One has to use judgment.

Mr. MINETA. The recent publicity given to particle W is an example whereas I understand that could have been an American facility except we did not fund it at some point and then it became something of—became an overseas thing. Is that an example of maybe where we are losing the lead in terms of what was some-

thing that we were really in the forefront of, and that was in the area of physics?

Dr. KEYWORTH. I think the W particle observation is something much more serious than that. You will notice last year that high-energy physics received the biggest increase in any single area of science, 19 percent. And it is seeing a near comparable increase this year. But this points out a much more serious flaw than inadequate federal funding.

You are seeing a community, a critically important area of science, tearing itself apart through an inability to distinguish between clearcut scientific priorities and what I will politely refer to as requirements for institutional stability.

There was ample money within the high energy physics program to utilize perhaps the world's best facility, the FermiLab, to do this same experiment. Instead, funds were drawn off to support what I think has been almost universally described by the community as a second-class facility, but one that nevertheless did represent institutional stability or institutional security.

We have tried to include in our budget a number of programs and mechanisms that will bring the community of those who need new manpower and those who need new technology, industries in particular, closer to the laboratories and the sources of new talent.

This is another aspect of the problem. We have got to bring the scientific establishment of this country to think of themselves as being major players in solving tomorrow's problems, not simply as being members, recipients of an entitlement program.

What I am trying to say is that there is a problem beyond just money.

Mr. MINETA. We have seen that Washington is not No. 2 and we ought to go for it.

Thank you, Mr. Chairman.

Mr. BROWN. Mrs. Schneider, I am prepared to recognize you now. You have to promise not to ask any critical questions about environmental research.

Mrs. SCHNEIDER. All right, Mr. Chairman. I am willing to go along with that. I happen to have a number of questions relating to energy. I will leave the other 15 questions on the environment to you.

Dr. Keyworth, I could have a series of questions to ask you. I will attempt to be as brief as possible.

I am interested in your reflection on the administration's policy direction toward greater investment of our dollars of energy research and development for the long-range high risk. Can you give me your reflections after these past 2 years as to what that policy directive has brought us to?

Dr. KEYWORTH. I think it has heavily brought us to two things—accepting a clearcut Federal responsibility for things such as fusion, which do represent a 21st century requirement or availability and, second, focusing broad disciplinary interests on long-term needs for energy.

For example, instead of providing and supporting new Federal loan guarantees for synthetic fuels, we conducted a program of basic research on materials that addressed some of the key prob-

lems that underlaid the development of new prototype facilities in synthetic fuels, new breakthroughs in ceramics.

I think there is a better partnership here between what the private sector can do and what the Federal Government will do.

The line of demarcation is important so each knows where the other's responsibility is. I think that has happened.

Mrs. SCHNEIDER. Could you elaborate a little bit on the study you have been conducting, analyzing the proposed cuts of the administration in the area of research and development for renewable resources in energy?

Mr. KEYWORTH. I am not—it is not clear to me——

Mrs. SCHNEIDER. I understand your office, within the past 12 months or so, has been conducting a study as to the merits or demerits of some of the cuts in the renewable energy area.

Dr. KEYWORTH. My office?

Mrs. SCHNEIDER. Your office.

Dr. KEYWORTH. I guess there are some things lurking in the corners.

Mrs. SCHNEIDER. Perhaps you can check that out and submit a response later in writing.

[The material follows:]

There has been no study in my office as to the merits or demerits of cuts in the renewable energy area. What my office did, however, was to propose the three criteria, which I discussed in my testimony, to guide the Administration's decisions on R&D funding allocations. The Department of Energy's overall R&D budget proposals were developed in this context, and the renewable energy programs were presumably analysed as part of this process. I suspect that the rumor that we are conducting a specific study in the renewable energy area may have arisen from DOE's own R&D budget preparation work.

Dr. KEYWORTH. Certainly.

Mrs. SCHNEIDER. One of the areas that I am particularly concerned with is—the reason I was late this morning is, I was listening to a briefing by a Nobel prize winning economist discussing our economic future. He had emphasized the part of energy policy in the equation of determining what our economy will look like in the near future. This is rarely taken into consideration. We either talk about raising taxes, cutting spending, dropping indexing, or whatever.

It seems to me that if we are looking toward a stable economy and we are looking toward a strong national defense, that part of your role as the adviser to the President—our emphasis is on energy policy—should be one of stability. It seems to me that the only stability that can be gained from our current energy policy or energy priorities is that we are putting all of our financial eggs in one basket, which is in the area of high risk, long range.

Now, as you know, in the seventies we experienced the turbulence of the oil embargoes and the various problems in the Middle East.

We are talking about balance of trade and our trade deficit next year being somewhere around $75 billion.

We do not seem to be addressing that in terms of R&D science policy or energy when it seems to me that we say, well, we will take care of our problems domestically when, in fact, we are going to be importing our photovoltaic technology from Japan—I guaran-

tee it—in the very near future; not to mention other types of energy technologies that are more near term than some of those that are being invested in by our Government.

I would just like your comments on that.

Dr. KEYWORTH. As far as the administration considering the role of energy policy in economic policy and planning, I think we have. I think there is something else besides the long-term 21st century technology that we have accepted and that is the Strategic Petroleum Reserve.

We feel the primary energy threat to our overall national security would be in a fairly short-term cutoff through some regional conflict or volatility.

As you know, we have been rather aggressively proceeding to fill the strategic petroleum reserve to accommodate that and to devise methods by which we will distribute that effectively.

I agree, there are areas where we may be importing technologies in the future. I am not sure that I would find photovoltaics as the first, because we have an aggressive program in that type of research. There certainly are others.

The nuclear area, for example, is one where, if this country cannot provide a basis on which nuclear can compete responsibly, then I think it is very likely that nuclear technology will become the purview of France.

I think France will be exporting high energy intensive products such as aluminum, at a cost that is very, very drastically less than we in the United States can produce it.

I do think we have a balanced program. I think energy is not the kind of No. 1 priority item it was in the seventies. I think we must recognize the influences of the marketplace between the early seventies and now. That is why we have so much more natural gas and oil and conservation today.

Mrs. SCHNEIDER. I realize my time is up. I would like to close by stating that you mentioned our energy situation is not the problem it was in the seventies. I would like to submit in the seventies the elected officials sitting in this room were working on crises management.

One of, I believe, the worst approaches to dealing with our national economy or dealing with any problem. It seems to me if we are doing long-range planning, our investment must not be singly focused into long range, but also be focused to the near term. Diversity lends itself to stability.

That is both energy stability and economic and international and national security stability.

Thank you, Mr. Chairman.

Mr. BROWN. Thank you, Mrs. Schneider.

Mr. Reid?

Mr. REID. No questions, Mr. Chairman. Thank you.

Mr. BROWN. Mr. Walgren?

Mr. WALGREN. Thank you, Mr. Chairman.

I wanted to ask Dr. Keyworth, with respect to the NSF budget proposals in particular, it is my understanding that the administration has recognized broadly that trained work force and skills in our work force in general are going to be the key to what we hope our economy will be and where we hope it will go and that the ad-

ministration has tried to address that very broadly across a number of fronts, and yet with respect to NSF, I understand the proposal in the research area, in particular, was strengthened by $190, almost $200 million which is a major and decent increment. Yet the training component and the education component in NSF would only be increased by something in the range of $9 or $10 million.

Wouldn't it seem that a different balance should be struck there?

Dr. KEYWORTH. Mr. Walgren, let me correct a major misconception here. There have been a few programs over the years that have been specifically labeled education in the National Science Foundation, but if we go back and look at the original mandate of the Foundation, in fact 100 percent of the National Science Foundation's budget is for education. NSF programs for research in an academic environment support thousands and thousands of students, tomorrow's talent.

It is true the biggest increases, the 25-percent increases in mathematics, plant sciences, astronomy and so on, are in areas other than those with the name education on them. But these programs also address other needs in education.

Mr. WALGREN. Certainly there is a dual effect of any dollars that are spent in that area and they certainly go to the education system.

It is also true, I am sure you would agree, that the research dollars per se are almost exclusively with postcollege effect and a little bit of college effect, but certainly nothing at all before, and it would seem that if we are going to address this training problem broadly that we ought to be, in my view, using every institution we have available to us if it can make a real significant contribution.

I am wondering whether we shouldn't be approaching the NSF in that frame of mind?

Dr. KEYWORTH. You certainly do raise a point that has taken a lot of our attention during the last year. Two of our programs in the NSF are addressing precollege.

Granted, they are small compared to the $1.2 billion of the entire NSF budget, but they are also very high in leverage in an area that is primarily the State and local governments' responsibilities.

In addition, there is a program, which I believe is $50 million, in the Department that addresses the same issue.

I think we do have a family of programs. I think the kinds of programs that have been proposed on the spur of the moment over the course of the last year have been more money than direction setting.

Instead, we now have some high leverage programs appropriate for today. They will provide leadership, but I don't think they will provide the solution. The solution is going to have to be, nationwide, not just a Federal Government or NSF role.

Mr. WALGREN. I certainly agree with that. I also feel that the problem that we are trying to address is really bigger than any of the institutions we have to address it, but that only underscores the point in my mind that it is most important that we use all of the avenues of progress on this problem that are available to us, including the NSF and including the others.

It has been my understanding that in far-times past in the NSF that there was a greater emphasis percentagewise in terms of the dollars overall on the education function as opposed to the pure research function.

This would be going back into the 1950's and early 1960's.

One other question, if I may. What role do you see for the Office of Science and Technology Policy to play in this balance that we are going to have to strike, if both the NSF and the Department of Education are involved in this effort?

Dr. KEYWORTH. I think we will play the role—perhaps even more aggressively than in the past—of working with each agency to try to come up with a coordinated program. This year we had a series of cabinet councils with the President in which this was discussed across many agencies, and I think that is why we are here with this budget today.

I think you will see even a stronger policy thrust that the President will encourage during next year.

I must make one comment. There is a vast difference between the role we are proposing for the National Science Foundation now and that which it held a few years ago, in which it was continuing to offer programs that came from the sixties.

I have said this many times, but it is no less true: we face new problems today because of this tremendous new competitiveness from our trading partners, as well as the Soviet Union.

We have tried to devise programs that address the problems in today's context; not a collection of anachronistic programs that were only marginally effective.

We have brought in hundreds of leaders from academia and industrial R&D and precollege education processes to give us their advice on where they felt the best lever could be inserted. I hope we will come up with even better programs and more effective programs in the future.

Again, money itself is not the solution to this new problem.

Mr. WALGREN. Just in closing, I certainly agree we want to make this program as effective as we possibly can. Certainly there are changes that have to be made. I have resisted what I felt was the political point of characterizing these programs as of the 1960's inasmuch as their real base, as I understand it, is in the educational policy of the fifties where we were really, as a whole society, without any aspersions as to the role of government one way or the other, as a whole society trying to grapple as best we could with the position we had fallen into.

I am always impressed with the wisdom of the people that went before me. I see a great deal of that in the NSF roles of the late fifties.

I look forward to working with you in the process, Dr. Keyworth.

Thank you.

Mr. FUQUA. Mr. Chandler.

Mr. CHANDLER. No questions, Mr. Chairman.

Mr. FUQUA. Mr. Walker?

Mr. WALKER. Thank you, Mr. Chairman. I am sorry, I just got here. I have no questions at this time.

Mr. FUQUA. Mr. Brown, further questions?

Mr. BROWN. I have a lot more questions, Mr. Chairman, but I am not sure how much time we ought to take with them.

Were you going to go until 11 o'clock? Maybe I could just ask one or two more.

Mr. FUQUA. As I mentioned—I think you were here—Dr. Keyworth is not feeling very well. He will stay.

Mr. BROWN. He is going to feel even worse when he gets through. Let me ask just one question.

Dr. Keyworth, I was quite interested in the initiative on scientific instrumentation. You have got a figure in the NSF budget—I think I recall—it is around $160 million, somewhere in that neighborhood.

We were fighting like mad last year and the year before to get $75 million. This represents a real increase.

Could you explain to us a little more about the background for that and how it will operate and I have certain concerns about it as all of the members of the committee over the years have reflected, and I want to see if you are responsive to those concerns.

Dr. KEYWORTH. Since I first came to Washington, I think there has been little question about the need for improvement in academic instrumentation, research instrumentation.

The question has been to find a mechanism. We set up a body about a year and a half ago to look at both the magnitude of the need, which we interpreted as being on the order of a billion-dollar problem, and the best solution.

Our essentially unanimous conclusion was that it would be best done if we could stimulate a coordinated response across all mission agencies that support R&D and basic research in particular.

So we have a coordinated program: DOD, NASA, the Department of Energy, and NSF. NSF is, I think, truly playing a leadership role. They are not funding it all.

The $180 million is the total capital equipment. There is a 61-percent increase in NSF's instrumentation budget. They are bearing part of the responsibility.

As you know, it is not something we are going to take care of overnight. We have to do two things: remedial work to over a few years restore the institutions; but then we have to go carefully to insure that we try to build in the mechanisms that will not allow this to happen again, that will not allow us in tight times to try to replace acquisition of new equipment with preserving institutional stability.

Mr. BROWN. So this $180 million, as the figure I see, is not just NSF, but includes several departments; it is a coordinated program. Is it a multiyear program?

Dr. KEYWORTH. The $180 million is just for NSF. The total for all agencies is about $400 million. And these will be multiyear programs.

Mr. BROWN. Is it operating in accordance with guidelines or other guidance from the Executive Office?

Dr. KEYWORTH. There has been very clearcut policy guidance on this. However, I do not think there has been an Executive order from the President.

Mr. BROWN. Could you submit to the committee the guidelines that the system is operating under?

[The material follows:]

INTERAGENCY INSTRUMENTATION GROUP

The guidelines that the Interagency Instrumentation Group is working under were set out in a statement of Purpose and Tasks sent to all members of the Group by NSF in June 1981, as follows.

PURPOSE

The Interagency Working Group on University Research Instrumentation will provide the Office of Management and Budget with information and suggestions on funding of research laboratories and equipment in the Nation's research universities.

TASKS

Review recent studies of status of university research instrumentation.
Consider appropriate Federal action.
Suggest one or more options for Federal assistance designed to help universities modernize their research laboratories.
Report the Working Group's discussion to appropriate officials at the Office of Management and Budget.

Dr. KEYWORTH. Certainly.

Mr. BROWN. In the NSF, I understand it will be incorporated as part of the regular granting process. Hence it will be done on a peer review basis, I presume?

Dr. KEYWORTH. Right.

Mr. BROWN. It will, therefore, go largely to the primary reserach institutions of the country? That causes a little bit of a problem among some members of the committee who feel institutions in Mississippi and Alabama, as well as California and Massachusetts, ought to get some of this money.

Has that factor been considered?

Dr. KEYWORTH. Yes, it has. We will respond to you across each agency and try to tell you what our objectives and guidelines have been.

[The material follows:]

RESEARCH INSTRUMENTATION AWARDS

The criteria by which the individual agencies will make research instrumentation awards differ among the agencies. DOD's evaluation of proposals will be based on the factors spelled out below which are contained in the DOD-University Research Instrumentation Program Announcement:

Proposals will be screened and evaluated by a DoD committee with representation from the Ramy Research Office, the Office of Naval Research, and the Air Force Office of Scientific Research. The evaluation factors will include:

1. The quality of the research.
2. The importance of the research to the total DoD research effort.
3. The potential for the proposed instrumentation to increase productivity of the research, or to provide a new capability which significantly augments present research productivity.
4. The potential for the proposed equipment to be fully utilized, including sharing with other groups.
5. The numbers of U.S. citizen graduate students who are being and will be trained on the associated research projects.
6. Previous research performance and adequacy of the institutional facilities.

The level of this program depends upon the availability of funds.

DOE has not yet finalized its instrumentation program plans, but expects them to closely reflect DOD's criteria.

NIH's criteria are as follows and can be found in its Biomedical Research Support (BRS) Shared Instrumentation Grants Announcement.

Applications are reviewed by specially convened initial review groups by the Division of Research Grants (DRG) for scientific and technical merit and by the BRS Subcommittee of the General Research Support Review Committee and the National Advisory Research Resources Council of the Division of Research Resources (DRR) for program considerations. Funding decisions are the responsibility of the DRR and will not be made prior to November 1, 1983.

Criteria for review of applications include the following:

1. The extent to which an award for the specific instrument would meet the scientific needs and enhance the planned research endeavors of the major users by providing an instrument that is unavailable or to which availability is highly limited.

2. The availability and commitment of the appropriate technical expertise within the major user group or the institution for use of the instrumentation.

3. The adequacy of the organizational plan and the internal advisory committee for administration of the grant including sharing arrangements for use of the instrument.

4. The institution's commitment for continued support of the utilization and maintenance of the instrument.

5. The benefit of the proposed instrument to the overall research community it will serve.

NSF's awards will be subject to their standard peer review process, as we discussed. However, criterion 4 for the selection of research projects, as stated below, can be found in NSF 81-79, and addresses the effect of the research on the nation's science and engineering infrastructure. This permits the distribution of awards with respect to institutions and geographical area to be explicitly included in proposal evaluation.

The National Science Board on August 21, 1981 agreed to the following criteria for the selection or research projects by the National Science Foundation:

"In order to provide for the fair and equitable election of the most meritorious research projects for support, the Foundation has established criteria for their review and evaluation. These criteria are intended to be applied to all research proposals in a balanced and judicious manner, in accordance with the objectives and content of each proposals. Four criteria for the selection of research projects by the National Science Foundation are listed below, together with the elements that constitute each criterion.

1. Research performance competence—This criterion relates to the capability of the investigator(s), the technical soundness of the proposed approach, and the adequacy of the Insitutional resources available.

2. Intrinsic merit of the research—This criterion is used to assess the likelihood that the research will lead to new discoveries or fundamental advances within its field of science or engineering, or have substantial impact on progress in that field or in other scientific and engineering fields.

3. Utility or relevance of the research—This criterion is used to assess the likelihood that the research can contribute to the achievement of a goal that is extrinsic or in addition to that of the research field itself, and thereby serve as the basis for new or improved technology or assist in the solution of societal problems.

4. Effect of the research on the infrastructure of science and engineering—This criterion relates to the potential of the proposed research to contribute to better understanding or improvement of the quality, distribution, or effectiveness of the Nation's scientific and engineering research, education, and manpower base.

Criteria (1), (2), and (3) constitute an integral set that are applied in a balanced way to all research proposals in accordance with the objectives and content of each proposal. Criterion (1), performance competence, is essential to the evaluation of the quality of every research proposal. The relative weight given Criteria (2) and (3) depends on the nature of the propsoed research: Criterion (2), intrinsic merit, is emphasized in the evaluation of basic research proposals, while Criterion (3), utility or relevance, is emphasized in the evaluation of applied research proposals. Criterion (3) also relates to major goal oriented activities that the Foundation carries out such as those directed at improving the knowledge base underlying science and technology policy, furthering international cooperation in science and engineering, and addressing areas of national need. Criterion 4, effect on the infrastructure of science and engineering, permit the evaluation of research proposals in terms of their potential for improving the scientific and engineering enterprise and its educational activities in ways other than those encompassed by the first three criteria. Included under this criterion are questions relating to scientific and engineering personnel, including participation of women and minorities; the distribution of resources with respect to institutions and geographical area; stimulation of quality activities in im-

portant but under developed fields; and the utilization of interdisciplinary approaches to research in appropriate areas.

Any specific criteria that apply to individual programs, while falling within the general criteria presented in this section, are contained in relevant program announcements or solicitations."

Mr. BROWN. Thank you.

The CHAIRMAN. Mr. Volkmer.

Mr. VOLKMER. Thank you, Mr. Chairman.

I am sorry I had to leave. I had another committee meeting.

Dr. Keyworth, I have reviewed your statement. There are some other things that I have looked at in the budget and what I find—correct me if I am wrong—the relationship of civil R&D as against military R&D, what I find in reviewing it is that the military, according to my figures, the total defense R&D is increasing considerably between 1982-1984, a 45 percent increase. Yet we had a slight decrease in what I call civilian, nondefense R&D.

Are those figures accurate?

Dr. KEYWORTH. Yes. That is essentially correct.

As I tried to say previously, what it does not reflect, however, is there was quite a bit of breadth with which to redirect funds in the civil program. So if you look carefully at the basic research end, you will see a substantial increase in the basic research component of civil R&D.

Mr. VOLKMER. Isn't it true though that some of the technologies that come out and some of the discoveries that come out of civilian R&D also have some military applications sometimes?

Dr. KEYWORTH. Both ways, yes. Some come out of civil. Probably more come out of defense because it is much larger.

Mr. VOLKMER. It does concern me when I look at the figures and find the actual dollar amounts, 1984, actually are slightly less than 1982 in nonmilitary R&D.

Dr. KEYWORTH. I think there is another way of looking at it. That is, what is the most threatened? I think as I tried to say today, America's academic institutions, the resources of talent for tomorrow, are threatened.

I think we are addressing it. With the kinds of thrusts we have taken, if sustained over a few years, we will be able to maintain U.S. leadership and superiority.

However, I think there is something else in defense. I think we have been remiss for a long period of time. A bulk of our defense modernization activities do appear as defense R&D.

To estimate what their balance should be, you have to take a look at the threat. The threat in the defense area is far more difficult to counter than the threat in maintaining an adequate U.S. science and technology enterprise and to maintain the world's best for that.

Mr. VOLKMER. Last year the NASA planetary budget seemed to indicate a desire to shut down the whole planetary program, and now the Congress tried to mitigate this.

They added funds for planetary research. This year you have added a planetary mission but, on the other hand, you have cut the core research program from $50.3 million to $45.5 million.

What is your position in regard to support for planetary—continued planetary programs?

Dr. KEYWORTH. We did, last year, continue to support a strong planetary program. We maintained the Galileo mission, for example, a very expensive mission, after much controversy. We did say, and we have continued to say, that we want to see a broader program than what I will state as excessive emphasis on planetary research alone.

Now, this new mission is very significant. Amidst all the furor and accusations, we asked the scientific community to see it they could come up with missions that could be more frequent and appreciably less expensive.

They took the Venus orbiting experiment, VOIR, and brought it from a $800-million mission to a $300-million mission called the Venus Mapper.

We think we can keep a much more vital program alive in planetary science with this type of approach. The community is excited about doing it, and we are excited about supporting it. But at the same time there have been new thrusts in other areas.

Last year we began the gamma ray observatory, an exciting area of astronomy and astrophysics. The space telescope continues to maintain the entire technically-oriented component of America's major interest.

Mr. VOLKMER. The final question I have—and I know my time must be running out—I notice in your statement that it appears you have come to the conclusion that the No. 4 space shuttle—four space shuttles is all we will require to cover all the necessary flights in the foreseeable future.

Dr. KEYWORTH. There has been a lot of careful review as what the usage pattern will look like in the future. We feel right now we have nothing to worry about.

We have kept the production line open by acquiring some very major components in the next fiscal year to the extent of about a hundred million dollars.

The decision as to——

Mr. VOLKMER. Is that to keep open the option of the fifth orbiter?

Dr. KEYWORTH. The first objective is to make sure the four remain operational. That is why the new components were there. I will say that, as a second order effect, we also note that at least a portion of the capability of the assembly line will be retained. The real bottom line is—and I don't mean to be equivocal at all—is that we do not foresee at this time, for several years to come, a dire need for a fifth orbiter.

Mr. VOLKMER. Mr. Chairman, may I have unanimous consent for one minute additional?

The CHAIRMAN. Yes.

Mr. VOLKMER. That bothers me a little bit.

Some of us feel that to provide the number of missions and to take care of the possibilities of mishap that could occur that we should look very seriously at this time, and I think we passed from last year on the question of the fifth orbiter, that if we don't get on with it the costs later on will be astronomical and be prohibitive.

Let's say that 2 years or next year we decide we want to start a fifth orbiter. Will the cost be tremendous as against if we started last year?

Dr. KEYWORTH. Let me offer my own observation. At this time we will be doing very well to use one-third of the available shuttle capacity. We must realize that missions have become fewer because they have become more reliable and because they have become more comprehensive. The original launch schedule was devised in the early seventies. We have since been very, very good at quality control and taking advantage of new technologies.

In my own judgment, I would say I can literally see hundreds of billions of dollars of more appropriately spent Federal dollars than to acquire the fifth orbiter at this time. It is simply uncalled for. I think we would have to see absolutely drastic changes in the space program, more than just the crash of one, before we would need a fifth orbiter.

I think we are very much over-served at the moment.

Mr. VOLKMER. Mr. Chairman, my time is up. Thank you.

Mr. FUQUA. Mrs. Schneider?

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

Dr. Keyworth, you were mentioning that we face a broad spectrum of new problems that are threatening us and we must, from time to time, be shifting our priorities. I think we all agree one of the purposes of R&D is to protect human health and the environment.

One of the things that concerns me is the EPA has recently handed over their responsibility for a strategy plan for safe drinking water and also ground water initiatives.

They handed over that responsibility to the Cabinet Council on Natural Resources and the Environment.

I wonder if you could elaborate on what commitment the executive branch is going to make to ground water protection and how that commitment will be reflected in the budget?

Dr. KEYWORTH. Needless to say, the issue has not been fully resolved.

I don't see how it could have been at this point.

Handing over something to a Cabinet Council is like taking an issue to the President. The President is the ultimate Chairman of the Cabinet Council process. It is an indication of the matter of either complexity or priority.

As you know, these are both major issues in the entire environmental arena, and what it is saying is that we are bringing all the judgment that we can bring to bear, that we have developed enough facts to have a reasonable review, and that is where we are proceeding right now.

I cannot tell you what exact directions or legislation we are going to propose, but I can certainly say it is coming to the absolute highest level of review.

Mrs. SCHNEIDER. Do we have any time line that the Cabinet Council is establishing for reaching a decision?

Dr. KEYWORTH. I can't offhand give them to you. If you would like, I can try to find them for you and give you a map.

[The material follows:]

SAFE DRINKING WATER

The Cabinet Council on Natural Resources and the Environment has not established a firm schedule for a final decision in either of these areas.

Mrs. SCHNEIDER. That would be appreciated.

The other thing I would like to raise insofar as the connection between environmental protection and science R&D is that I don't know if you are aware of it or not, but by the Environmental Protection Agency lessening their regulatory requirements on the disposal of hazardous wastes in landfills, we have heard testimony over the past year that clearly indicates that the private sector is being deterred from further investments in R&D; the technology is, in fact, there to dispose of the hazardous wastes, but they are not frustrated in that; the Government is diminishing the environmental protection requirements to make it easier for the polluter when, in fact, those problems could be solved by science and technology.

I would just like you to be aware of that.

If you have comments, I would love to hear them.

Dr. KEYWORTH. First of all, we are trying not just within EPA, but within NIH, FDA, and so on, to maintain as strong a basis as we can for improved future and present regulatory legislation. It does require judgment. We believe we have reached a point where we have an excessive burden on American society and American industry and that there have to be changes.

The example you have given us is one I am familiar with. It is an example of how once people and institutions have accommodated a mechanism to react to any regulation, then change requires that they have to reaccommodate to that. It is a natural resistance to change.

You know better than I that the process of introducing change in Government inevitably finds a good fraction of society at your doorstep.

Mrs. SCHNEIDER. Certainly in providing an incentive for change and helping us move from the low technology to high technology solution to problems, it seems that here is a good opportunity for the Government to support the leadership that is being provided by the private sector, and we don't see that happening.

We see the government taking the opposite direction.

Dr. KEYWORTH. There are many different ways of providing that incentive. For example, a company that makes monitoring gear finds a different set of incentives attractive than other areas of American industry.

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

Mr. FUQUA. Thank you, Mrs. Schneider.

Mr. MacKay?

Mr. MACKAY. No questions, Mr. Chairman.

Mr. FUQUA. Mr. Reid?

Mr. REID. No questions.

Mr. FUQUA. Mr. Mineta?

Mr. MINETA. No questions, Mr. Chairman.

Mr. FUQUA. Mr. Bateman?

Mr. BATEMAN. Dr. Keyworth, some 3 or 4 days ago there was an account in one of the newspapers of America lagging in the area of high energy physics.

You made some passing reference to it in response to an earlier question. I don't know if you happen to have seen the article, but is it your view that this is an area of significant national concern in terms of the United States lagging behind the Western European

countries, Japan, and perhaps and probably the Soviets in that area?

If so, are we doing anything in what is being proposed to address that deficiency?

Dr. KEYWORTH. Thank you. I do find it significant, not as an area where we have lost the lead, but as a symbol of the new competition that we are finding from every corner and essentially every area of our society.

Yes, the Europeans do have a competitive capability; and yes, they may or may not have made a major breakthrough that a few years ago would almost certainly have occurred within the United States.

What are we doing? This is an incredibly exciting area of science that perhaps I think is about as creative an area of science as there is. It also is an area that has traditionally received and is continuing to receive top priority in support from the Federal Government.

Last year we made a 19-percent increase in the support of this area of science, already pushing a half billion dollars. This year we are doing the same. But I did say before, and I can't help but mention again, that the major problems in this community are not funding. They are institutional.

We are trying to work as closely as we can with the community to resolve those, as is the Department of Energy, which bears the primary responsibility.

Mr. BATEMAN. When you make reference to a significant element of the problem being institutional, is this with your university-related research capabilities in this area as opposed to federal laboratory investigations in the area?

Dr. KEYWORTH. It is both. It is definitely both, perhaps half and half. Let me say explicitly what I mean by institutional is that primary decisions have to be made in every place, as you well know.

When asked, the community has been willing to come up with a set of crisp priorities. And they are more important in this area than perhaps in any other field of science.

The machines required cost in the billion-dollar range, yet there are only 1,000 or 2,000 scientists in this field in the country. They are difficult decisions.

But then when it comes down to implementation, it has been difficult to retain a distinction between the most responsible approach to assure America's leadership versus making sure all the community is well taken care of and well fed.

Mr. BATEMAN. Thank you.

Mr. FUQUA. Thank you, Mr. Bateman.

Dr. Keyworth, in followup to a question asked by Mr. Volkmer about the fifth orbiter, as recent as the latter part of January the Under Secretary of the Air Force was quoted as saying that the Air Force supported the fifth orbiter, provided the funds didn't come out of their budget.

Does the Air Force still support the fifth orbiter in light of what the final budget decision has been?

Dr. KEYWORTH. During the process of review of this issue, I think it became more and more clear to more and more people the degree of security we had built in. I think the Air Force has not

been supportive of the fifth orbiter in the most recent considerations.

Mr. Chairman, I must admit that the traditional response of, "we think your proposal is great as long as it doesn't cost us anything," is a pretty comprehensive degree of shallow support.

Mr. FUQUA. Of course, they never proposed any of that come out of their budget and would prefer that all costs be borne by NASA or somebody else. That is not new.

Dr. KEYWORTH. The Department of Defense does support approximately half of the entire U.S. space program.

So that part that has been clearly their purview, they have never questioned embracing.

Mr. FUQUA. I was really speaking of the part—the reimbursable part to NASA that they have. Of course, that has been something that we had a great deal of discussion about in the last Congress in the proposal by Senator Schmitt to change the pricing policy for the Air Force.

That is still, I gather, under review at this time, but I did see a quote from the Under Secretary about the fifth orbiter.

Of course, that is not a new position for them, not having the money come out of their budget. It was never intended to come out of their budget from the beginning.

Thank you, Dr. Keyworth. We appreciate your being here this morning. I again want to commend you and your staff for their cooperative spirit that we have had with this committee over the years. We look forward to——

Mr. VOLKMER. Mr. Chairman, may I say something?

I would like to know, Dr. Keyworth—and we will have others up here this afternoon to go into this—but you mentioned—and it is true—there is money in the budget to keep the lines open on the shuttle manufacturers of parts, et cetera. What is the purpose of this? How long?

Dr. KEYWORTH. Right now we have a commitment to one year. The purpose is to acquire some of the major spare parts that would be required if any of the existing four shuttles received any kind of serious damage or failure. It has been the primary objective.

I mentioned and tried to make clear that a side benefit is that for another year we retain the option of committing to a future acquisition, because a good part of a portion of the assembly line does stay alive.

But there has been a clearcut decision that at this time we do not need to procure a fifth orbiter. We feel quite secure in our launch services that will be available for some time to come.

Mr. VOLKMER. Has a decision been made then at the end of the year that you will no longer be acquiring some of these parts and the line will be closed down?

Dr. KEYWORTH. The decision has been that until the launch load projection curve looks different than it does now, we will not commit ourselves to buying a fifth orbiter.

Mr. VOLKMER. I am talking about the lines for a year. You say you have a commitment to hold the lines open for a year?

Dr. KEYWORTH. I tried to say we have no commitment to keep the line open for a day, let alone a year. What we are doing is purchasing $100 million worth of spare parts. The effort was not to

keep the line open. The effort was to buy those parts. It so happens they come off the same line that builds the orbiters. We get that.

At the end of the year, where will we be? It depends what we choose to do next year.

Mr. VOLKMER. You have made no decisions as far as next year?

Dr. KEYWORTH. We made no decision to do anything except procure those parts. We have not put a fifth orbiter into the 1984 budget because we have no need for it.

Mr. FUQUA. Mr. Walgren has a question.

Mr. WALGREN. Dr. Keyworth, how directly involved is the Office of Science and Technology in the administration's recommendation of cuts for the National Bureau of Standards, particularly with respect to fire research and building earthquake resistance efforts of the Federal Government?

Dr. KEYWORTH. For various reasons, from emergency preparedness through science policy, we have had some involvement in those decisions. The majority of those decisions to reduce funding in NBS occurred because they were in areas where we felt research in the private sector was being overlapped in a heavy way.

Mr. WALGREN. That would be the justification then for eliminating the $5 million that we spend on the Federal level on basic fire combustion and materials combustion despite the fact that that problem takes so many lives and causes so much property damage?

Dr. KEYWORTH. I can't testify to the complete reason for why those funds were cut. I think the question is not only how important the problem is—and I cannot disagree with you in any way about the horrors of fires—but how pertinent the program is and how we consider this research in comparison with what is going on in the private sector in these areas, in materials, underwriters laboratories, and so on.

I don't remember if I ever knew the exact details of where other efforts were and what went through the decision process there.

Mr. WALGREN. I wonder if it would be proper for me to ask if you could have somebody reduce the factors in that decision to writing, particularly what you saw happening in the private sector that would replace on an immediate basis what was being done in fire research in particular?

From a personal viewpoint, I believe it is correct to say the administration has been really backing out of major fire roles that have been on the Federal level in the past, particularly with the elimination of the Fire Administration, falling back on the Fire Academy, although there is a certain overlap there.

There is also a certain amount that was not overlapped.

Now, to see the Bureau of Standards eliminated, reductions are one thing, but elimination of a function is another. I would really appreciate seeing in great written detail the justification for that decision.

Dr. KEYWORTH. We will do that as soon as we can and as comprehensively as we are able.

[The material follows:]

FIRE RESEARCH

As I noted in my testimony, we have enunciated three principles to guide the Administration's decisions on R&D support. The two most relevant for programs with

commercial applicability are the pertinence to society's needs, and the appropriateness for Federal action. It is the agencies' responsibility to make R&D program funding decisions within these guidelines, and my office does not normally get involved in such detailed budget allocation decisions. I understand that funding for fire research was not in the Department of Commerce's original budget submission to OMB. Thus the elimination of fire research support was an internal decision, based primarily on the Department's own priorities.

Mr. WALGREN. Thank you very much. I appreciate that.

Thank you, Mr. Chairman.

Mr. FUQUA. Again, Dr. Keyworth, thank you very much for being here this morning. We appreciate your testimony.

The committee will stand adjourned.

[Whereupon, at 11:15 a.m., the committee was adjourned.]

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